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PERMIAN FORAMINIFERA FROM TUNISIA

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ABSTRACT

Approximately 1,700 meters of marine Permian rocks are exposed at Djebel Tebaga, in southern Tunisia, on the south flank of a faulted anticline. These sediments consist of shales, sandstones, limestones, and dolomites. Many of the limestones contain an abundance of fusulinids belonging to the genera *Dunbarula*, *Schwagerina*, *Chusenella*, *Neoschwagerina*, and *Yabeina*. The endothyrid genus *Kahlerina* is also represented. In a deep well at Bir Soltane, some 40 kilometers farther west, the fusulinid genera *Staffella* and *Afghanella* are abundant in certain zones; *Verbeekina*, *Neoschwagerina*, and *Sumatrina* are present but rare.

INTRODUCTION

Several years ago Dr. CARL O. DUNBAR sent us a small piece of limestone from Djebel es Souïnia, Tunisia, containing topotypes of *Dunbarula mathieui* CIRY. Still later, Dr. RAYMOND CIRY sent us more material from the same collection as well as about two dozen loose specimens of *Yabeina syrtalis* (DOUVILLÉ) from nearby Djebel Tebaga. At about the same time Dr. M. L. THOMPSON sent us several small pieces of limestone from Djebel Tebaga containing *Yabeina punica* (DOUVILLÉ). Finally, in March, 1965, we received a suite of collections made by Dr. CHARLES GLINTZBOECKEL from the Djebel Tebaga sequence, as well as a series of core chips from the well at Bir Soltane, about 40 kilometers west of Tebaga. Dr. GLINTZBOECKEL has graciously granted us permission to publish descriptions of the fusulinids contained in these collections. Dr. H. BISMUTH, of S.E.R.E.P.T. in Tunis, Tunisia, has furnished geographic and stratigraphic data on the Djebel Tebaga section. We wish to express our thanks to these gentlemen for providing us with this interesting material and information, and to the Humble Oil & Refining Company for permission to publish this study.

The presence of marine Permian sediments in southern Tunisia was first reported by DOUVILLÉ, SOLIGNAC & BERKALOFF (1933). The area in question, Djebel Tebaga, is located 56 kilometers to the south-southeast of Gabes and 26 kilometers west-northwest of Médenine (Fig. 1).

Djebel Tebaga consists of two parallel ridges forming the south flank of a roughly east-west trending, faulted anticline. This structure plunges to the east, but is still opening westward at the point where it passes beneath the Cretaceous bluffs of the eastern edge of a high plateau, variously called Monts des Matmatas, Monts des Ksours, or Plateau of Zmertene (Fig. 2). The total length of the Permian exposure, in an east-west direction, is approximately 14 kilometers. The northern ridge of Djebel Tebaga is called Baten Beni Zid, but the southern ridge bears no special name.

Topographically, these ridges are interrupted by several passes which, from west to east, are called Merbah el Oussif, Merbah el Tabaga, and Merbah el Guettat, respectively. Baten Beni Zid cannot be traced eastward of Merbah el Guettat, but the southern ridge is prolonged beyond that break. This eastern continuation is called Djebel es Souïnia and it, in turn, is divided into two parts by a deep pass. The eastern portion of Djebel es Souïnia bears the special name of Djebel Saïkra.

The anticlinal axis on the north side of Djebel Saïkra is complicated by both normal and reverse faulting, and a sharp subsidiary anticline is present on the north side of Baten Beni Zid. North dip on the main anticline has been observed only in the westernmost outcrops where the lowest part of the exposed Permian passes beneath the Cretaceous bluffs which overlie it unconformably. The greater part of the anticlinal axis lies beneath the plain of Oued Tourmamane and is concealed by Quaternary alluvium.

According to Mathieu (1949), the Permian dips on the south limb of the main anticline vary from 30 degrees to nearly vertical, averaging

Fig. 1. Index map showing location of Djebel Tebaga and Bir Soltane.

around 35 to 45 degrees to the south-southeast. The oldest beds are poorly exposed in the lower slopes of the promontory of Oum el Afia. They consist of reddish purple shales and sandy shales with a few thin beds of limestone. These limestones contain *Schwagerina tunetana* (DOUVILLÉ). DOUVILLÉ, SOLIGNAC & BERKALOFF (1933) estimated this sequence to have a thickness of about 135 meters.

Next comes a succession of yellow quartzites, soft, white, cross-bedded sandstones, and ferruginous sandstones. At the base of the sequence they alternate with red shales, and near the top they are interbedded with greenish limestones, dolomitic limestones, and very fossiliferous marls. The limestones, some of which are soft and marly, contain an abundance of neoschwagerinids. In the upper part of this sequence, which makes up the northern slope of Baten Beni Zid, are yellow limestones in which some beds contain numerous crinoids. DOUVILLÉ, SOLIGNAC & BERKALOFF assigned a thickness of 160 to 180 meters to this succession.

The crest of Baten Beni Zid is made up of dolomitic or siliceous limestone and massive dolomite having a thickness of about 60 meters.

The depression between the two ridges of Djebel Tebaga is occupied by about 570 meters of poorly exposed sandstones, marls, and greenish crinoidal limestones. Sponges and corals are numerous, and some of the limestones are filled with *Yabeina syrtalis* (DOUVILLÉ). This sequence also makes up the lower part of the north flank of Djebel es Souïnia and Djebel Saïkra to the east. Near the top of the succession are platy limestones rich in *Cyathocrinites* and *Martinia*.

The crest of the southern ridge of Djebel Tebaga is made up of a succession of dolomitic limestone and massive dolomite having a thickness of about 50 meters. These dolomites also form the crest of Djebel es Souïnia and the upper part of the north flank of Djebel Saïkra.

Overlying the dolomites at the western end of Djebel Tebaga and on the south side of Djebel Saïkra is a long succession of very fossiliferous platy limestones, sandstones, marls, and shales which have been referred to as the "Zone of *Bellerophon* limestones" and compared to the Bellerophonkalk of the Alps. Near the base of this sequence some of the limestones contain an abundance of large crinoids and echinoid plates and spines. Other limestones contain a profusion of *Dunbarula mathieui* CIRY, which was found by GILBERT MATHIEU on Djebel Saïkra. More recently, GLINTZBOECKEL & RABATÉ (1964) have found this same fusulinid, accompanied by *Neoschwagerina* and *Yabeina*, in equivalent beds at Oudjah el Rhar, near the west end of the south flank of Djebel Tebaga. This long sequence is overlain unconformably by red Triassic sandstones which also dip to the south, but less steeply than the Permian.

The Cenomanian of the plateau to the west laps progressively northward across the beveled edges of the Triassic and Permian beds.

FUSULINID COLLECTIONS

Tu-1 Permian limestone. "Bellerophon limestone" zone. South slope of Djebel Saïkra. Contains topotypes of *Dunbarula mathieui* CIRY. Collected by MATHIEU and donated by CARL O. DUNBAR.

Tu-2 Permian limestone. From same locality as Tu-1, and probably from same collection. Collected by MATHIEU and donated by R. CIRY.

Tu-3 Permian limestone. Beds between the two ridges of Djebel Tebaga. Contains topotypes of *Yabeina syrtalis* (DOUVILLÉ). Donated by R. CIRY.

Tu-3A Permian limestone. From the north slope of Baten Beni Zid. Contains topotypes of *Yabeina punica* (DOUVILLÉ). Donated by M. L. THOMPSON.

Collections Tu-4 to Tu-15 were made by CHARLES GLINTZBOECKEL along a section across the western part of Djebel Tebaga.

Tu-4 Permian limestone. North slope of Baten Beni Zid. Coll. GLINTZBOECKEL 0-307.

Tu-5 Permian limestone. North slope of Baten Beni Zid. Coll. GLINTZBOECKEL 0-308.

Tu-6 Permian limestone. North slope of Baten Beni Zid. Coll. GLINTZBOECKEL 0-336.

Tu-7 Permian limestone. North slope of Baten Beni Zid. Coll. GLINTZBOECKEL 0-338.

Tu-8 Permian limestone. North slope of Baten Beni Zid. Coll. GLINTZBOECKEL 0-338. Although this bears the same field number as Tu-7, the lithology is different. They probably came from two separate beds.

Tu-9 Permian limestone. Beds between Baten Beni Zid and the southern ridge of Djebel Tebaga in Merbah el Oussif. Coll. GLINTZBOECKEL.

Tu-10 Permian limestone. North slope of southern ridge of Djebel Tebaga. Coll. GLINTZBOECKEL.

Tu-11 Permian limestone. South slope of Djebel Tebaga in Oudjah el Rhar. Same general zone as Tu-1 and Tu-2. Coll. GLINTZBOECKEL 0-387.

Tu-12 Permian limestone. South slope of Djebel Tebaga in Oudjah el Rhar. Coll. GLINTZBOECKEL 0-387b.

Tu-13 Permian limestone. South slope of Djebel Tebaga in Oudjah el Rhar. Coll. GLINTZBOECKEL 0-387′.

Tu-14 Permian limestone. South slope of Djebel Tebaga in Oudjah el Rhar. Coll. GLINTZBOECKEL 0-388′.

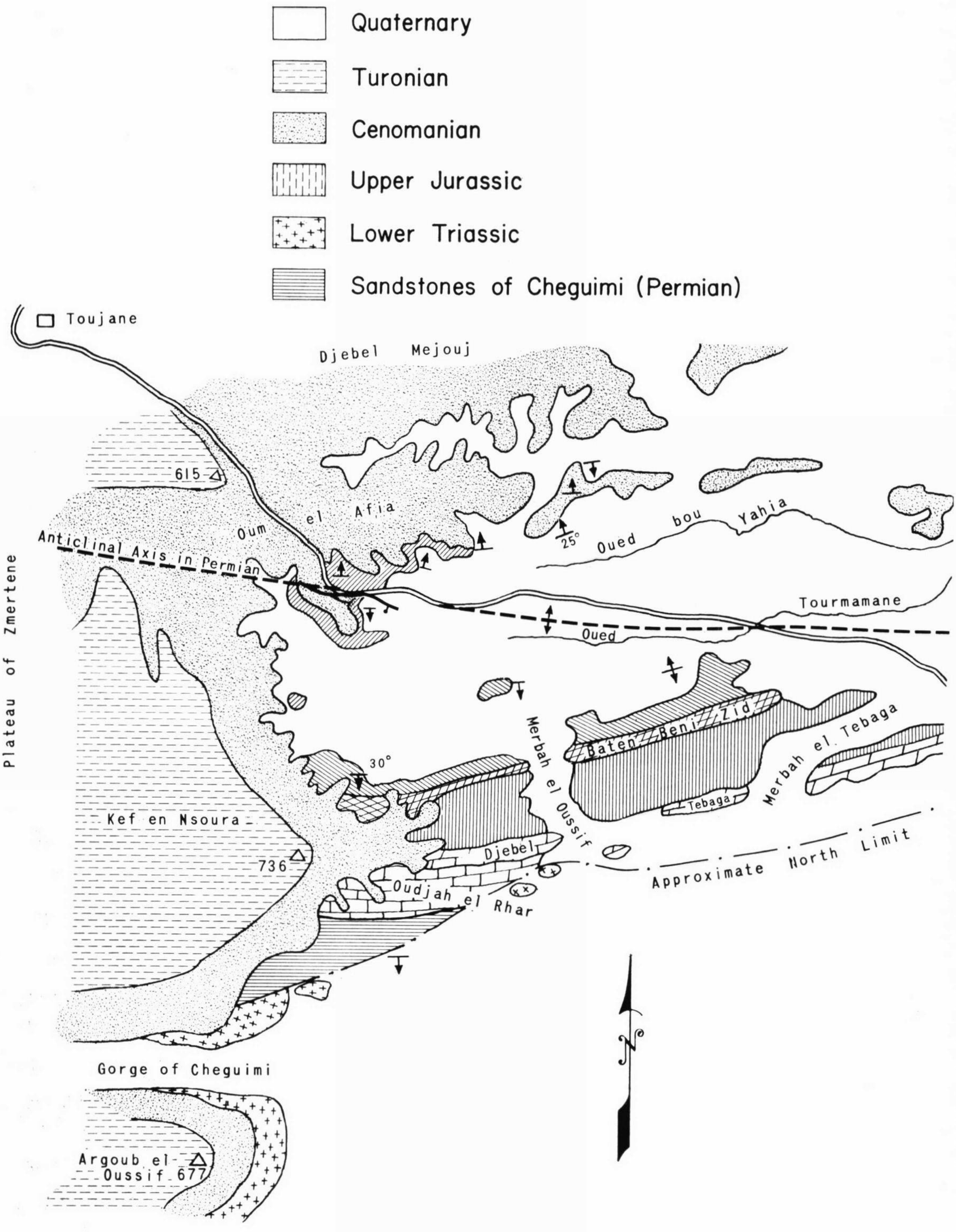


FIG. 2. Geologic map of Djebel Tebaga (modified from Mathieu, 1948).

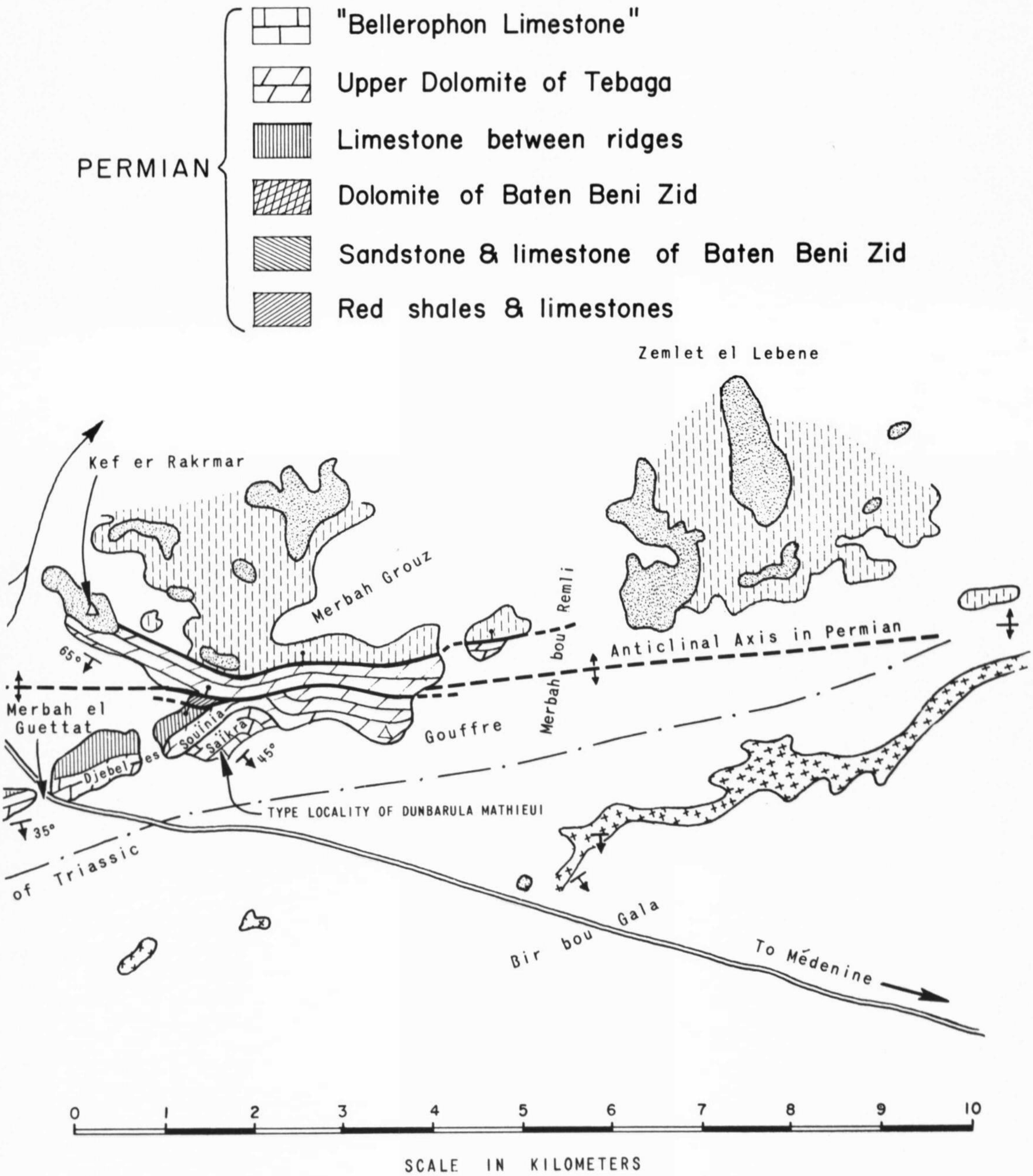


Fig. 2. *(Continued.)*

Tu-15 Permian limestone. South slope of Djebel Tebaga in Oudjah el Rhar. Coll. GLINTZBOECKEL 0-390′.

Collections Tu-20 to Tu-25 are core chips from a well at Bir Soltane approximately 40 kilometers southwest of Djebel Tebaga. They were donated by GLINTZBOECKEL.

Tu-20 Permian limestone. From a depth of 2,137 to 2,138.6 meters in the Bir Soltane well.

Tu-21 Permian limestone. From a depth of 2,241.4 to 2,243.7 meters in the Bir Soltane well.

Tu-22 Permian limestone. From a depth of 2,242.6

STRATIGRAPHIC SEQUENCE OF COLLECTIONS	FORAMINIFERA								
	Kahlerina africana	Dunbarula nana	Dunbarula mathieui	Chusenella rabatei	Neoschwagerina glintzboeckeli	Neoschwagerina tebagensis	Neoschwagerina fusiformis	Yabeina punica	Yabeina syrtalis
Tu - 1, 2			A	C					
Tu - 15			A	C			R		
Tu - 14			A						
Tu - 13			A						
Tu - 12								A	
Tu - 11			A	C					
Tu - 10								A	
Tu - 9, 3									A
Tu - 5					C				
Tu -8, 3A		R						A	R
Tu - 7		R						A	
Tu - 6	C	C				C			
Tu - 4		C							

FIG. 3. Stratigraphic sequence of collections and occurrence of Foraminifera. [Explanation: A, abundant; C, common; R, rare.]

meters in the Bir Soltane well. This is part of the same core as Tu-21.

Tu-24 Permian limestone. From a depth of 2,497.5 meters in the Bir Soltane well.

Tu-25 Permian limestone. From a depth of 2,642 meters in the Bir Soltane well.

Figure 3 shows the stratigraphic order of the collections from Djebel Tebaga and the occurrence of the various species in them.

All figured holotypes and paratypes are deposited in collections of the Paleontological Institute of the University of Kansas, Lawrence, Kansas; all other figured specimens are in the files of the Humble Oil & Refining Company at Midland, Texas.

SYSTEMATIC PALEONTOLOGY

Family ENDOTHYRIDAE Brady, 1884

Subfamily ENDOTHYRINAE Brady, 1884

Genus KAHLERINA Kochansky-Devidé & Ramovš, 1955

KAHLERINA AFRICANA Skinner & Wilde, n. sp.

Shell minute, thickly discoidal, with broadly rounded periphery; axis of coiling is shorter diameter and shell is umbilicate; mature specimens have about 4 whorls with axial length 0.80 to 0.95 mm., and sagittal diameter 1.21 to 1.61 mm.; form ratio 0.57 to 0.67.

Spirotheca composed of thin tectum and relatively thick inner layer which possesses poorly visible alveolar structure and which is analogous to keriotheca of some fusulinids; in third volution spirotheca varies in thickness from 36 to 58 μ, averaging about 50 μ. Septa unfluted but convex anteriorly, appearing to be formed by simple inbending of spirotheca and composed of the same elements as latter; they are thick throughout their length, becoming even thicker along their basal margins so that in sagittal sections they appear club-shaped; large septal pores present, particularly along basal margins of septa, which number about 8 in 1st whorl, 8 in 2nd, 7 to 10 in 3rd, and 10 in 4th.

Proloculus small, with outside diameter 101 to 140 μ. Tunnel low and not very wide, tunnel angle varying from 26 to 35 degrees in 4th whorl; tunnel formed by coalescence of several large pores which follow base of each septum (Pl. 1, fig. 1-2, 6-7); usually this coalescence leaves remnants of basal margin of septum intact, and such remnants have been interpreted by some authors as parachomata. [This illusion is heightened by the presence of large septal pores on either side of the tunnel which have sometimes been mistaken for multiple foramina. Tangential sections show that no parachomata are present, and these features are observed only where a septum coincides with the plane of a section.] No chomata present.

Illustrations.—Plate 1, figures 1-7; 1, 6, axial section of holotype, ×40, ×80; 2, 7, axial section of paratype, ×40, ×80; 3, axial section of paratype, ×40; 4-5, sagittal sections of paratypes, ×40. [All specimens from collection Tu-6. All figures are unretouched photographs.]

Discussion.—*Kahlerina africana* SKINNER & WILDE, n. sp., differs from *K. siciliana* SKINNER & WILDE in its smaller size and narrower tunnel. It may be distinguished from *K. pachytheca* KOCHANSKY-DEVIDÉ & RAMOVŠ by its fewer whorls, smaller form ratio, and commonly larger proloculus.

Occurrence.—This species is sparingly common in collection Tu-6, where it is associated with *Neoschwagerina tebagaensis* SKINNER & WILDE, n. sp.

Family STAFFELLIDAE Miklukho-Maklay, 1949

Subfamily STAFFELLINAE Miklukho-Maklay, 1949

Genus STAFFELLA Ozawa, 1925

Staffella OZAWA, 1925, p. 10.
Eoverbeekina LEE, 1933, p. 18-19.

Type species.—*Fusulina sphaerica* ABICH, 1859, p. 489, 538.

Prior to 1877 all fusulinids recognized as such were assigned indiscriminately to the genus *Fusulina* FISCHER. In that year VON MÖLLER proposed three new genera, *Fusulinella*, *Hemifusulina*, and *Schwagerina*. He designated *Fusulinella bocki* VON MÖLLER, a fusiform species, as the type species of *Fusulinella*, but he also included in the genus several lenticular or subglobular species. The genus was distinguished on the basis of its spirothecal structure which consisted of four layers. These were a tectum, a relatively clear layer which VON MÖLLER thought to be a void space and which he called the "*Zwischenraum*," and two denser layers, one on the outside and one on the inside. The last are now known to be composed of secondary material and are called the tectoria, whereas VON MÖLLER's "*Zwischenraum*" is now known to be an actual layer of spirothecal material and is called diaphanotheca. This wall structure is typically displayed by *F. bocki*.

During the several following decades quite a number of small, lenticular or subspherical species were described by various authors and assigned to *Fusulinella*, but no other fusiform species were added to the genus. These forms, with axis of coiling in the shorter diameter, were usually so poorly preserved that detailed structure of the spirotheca was obscure. Because of thinness of the wall, however, its structure was assumed to be the same as that of *F. bocki*. As a result, the common concept of *Fusulinella* came to be that of a lenticular, discoidal, or subspherical shell rather than a fusiform one, as in the type species. This concept reached its culmination when DEPRAT (1912), apparently under the impression that *Fusulinella* included only these shorter forms, proposed the new genus *Neofusulinella* for a fusiform species which he considered to differ from *Fusulinella* only in elongation of the coiling axis.

OZAWA (1925, p. 10) concluded that "the type of lenticular or spheroidal form must be separated from *Fusulinella* as a new genus," and he proposed the name *Staffella* for such species, with *Fusulinella sphaerica* VON MÖLLER (=*Fusulina sphaerica* ABICH) as the type species. Later, in response to an inquiry, he told C. O. DUNBAR (personal communication), "When I established the new genus *Staffella*, I selected at random a spheroidal species in the paper of MÖLLER."

LEE (1927) proposed to divide *Fusulinella* into two subgenera, using DEPRAT's *Neofusulinella* for the fusiform species, including *F. bocki*, and OZAWA's *Staffella* for the lenticular and spheroidal forms. This, of course, is contrary to the International Rules of Zoological Nomenclature, which provide that "If a genus is divided into subgenera, the name of the typical subgenus must be the same as the name of the genus." Thus, no subgeneric name other than *Fusulinella* may be used to include *F. bocki*, the type species of the genus.

THOMPSON (1942) pointed out that the early Pennsylvanian species which had been assigned to *Staffella* differ from the type species, which came from the Permian of Armenia, in several significant ways. They were much smaller than *S. sphaerica* and possessed a more or less spherical juvenarium, in contrast to the lenticular early whorls of the latter. For these smaller species he proposed the generic name *Pseudostaffella*, with *P. needhami* THOMPSON as the type species.

Another significant difference, which THOMPSON did not mention at the time, is the fact that *Pseudostaffella* is invariably well preserved whereas *Staffella* is nearly always poorly preserved, even when associated genera have good preservation. This circumstance strongly suggests a difference in original shell composition. Because of this poor preservation, the nature of the minute wall structure of *Staffella* has never been securely established.

Meanwhile, LEE (1933) proposed the new generic name *Eoverbeekina* for *E. intermedia* LEE, a spheroidal species from Kweichow, China. Also, he questionably referred to this species a form which is abundant in the Chihsia Limestone of the Nanking Hills. He noted, however, that the latter invariably is poorly preserved, inferring that the Kweichow specimens were in a better state of preservation. An examination of his photographs shows that this comparison is generally true, but the preservation of the Kweichow specimens still leaves much to be desired.

Eoverbeekina was said to possess a median tunnel, as in *Staffella*, as well as a few parachomata and multiple foramina on either side of the tunnel. LEE regarded this genus as immediately ancestral to *Verbeekina*, the latter developing from the former by a loss of the median tunnel and a strengthening of the parachomata. However, the fact that *Verbeekina* invariably displays the same type of preservation as associated fusulinids strongly suggests a fundamental difference in original shell composition, and we do not believe that the two are closely related. LEE's specimens, even those from Kweichow, are so poorly preserved that the characters which he described cannot, for the most part, be seen in his photographs. Only one photograph (his pl. 2, fig. 3) shows what he believed to be multiple foramina. As will be shown later, however, we judge these to be merely a row of large septal pores. In his description of *E. intermedia* LEE (p. 19) noted a strong resemblance to *Staffella sphaerica* (ABICH), the type species of *Staffella*. Moreover, the two are of about the same age, Middle Permian.

THOMPSON & FOSTER (1937) described a species from the Middle Permian of Szechuan Province, China, as *Eoverbeekina cheni*. It was said to possess a median tunnel and multiple foramina, but no parachomata were observed. As in *E. intermedia*, the preservation of these specimens is so poor that the cited characters are not visible in the figured photographs.

Thompson & Miller (1944) described a species from the Permian Paso Hondo Formation of Chiapas, Mexico, as *Eoverbeekina americana*. It was said to possess a median tunnel in the early whorls which divided into two tunnels in the later ones. At about the same growth stage multiple foramina were reported to appear, with poorly developed parachomata between the foramina in the outer whorls. Again, the preservation of the specimens is so poor that these features cannot be confirmed by inspection of their photographs. Dr. Thompson kindly sent us several large pieces of topotype material, and we have made numerous thin sections from it. This has been supplemented by our own collections from the same locality. We have been unable to find any trace of parachomata in the sections, nor have we observed the divided tunnel in the outer whorls.

Kochansky-Devidé (1952) described a species from the Permian Paklenica Dolomite of Jugoslavia as *Eoverbeekina paklenicensis*. In addition to four photographs she figured a composite drawing showing her interpretation of the species as seen in axial section. The drawing shows a low median tunnel bordered by low, asymmetrical chomata and, from the fifth whorl outward, multiple foramina separated by low parachomata. Such foramina and parachomata are not visible in the photographs. In addition, the drawing shows a spirotheca composed of a tectum and a thick, finely alveolar keriotheca, although this minute structure cannot be seen in the photographs.

Dr. Kochansky-Devidé has kindly provided us with topotype material from which we have prepared numerous thin sections, two of the best of which are show here (Pl. 2, fig. 1-2). The rock is a light gray, dolomitic limestone literally filled with fusulinids which tend to shell out of the matrix so that it is not difficult to obtain loose specimens. Unfortunately, recrystallization has partially destroyed or obscured many of their internal characters, but a study of numerous specimens permits reconstruction of salient features. The characters of the tunnel and chomata are essentially those depicted by Kochansky-Devidé, but we have been unable to find any trace of parachomata in our specimens. In one of our axial sections (Pl. 2, fig. 2) the plane of the section coincides with the first septum behind the antetheca. The tunnel opening had not yet been resorbed in this septum, but the latter is pierced by a double row of large septal pores. One row follows the base of the septum, while the other is located just above and parallel to the first. The tunnel opening was formed by the resorption of the septal material separating several of these pores near the center of the shell. As a result, the upper margin of the tunnel opening is commonly scalloped or crenulated, reflecting the upper margins of the constituent pores (Pl. 2, fig. 1). A similar crenulation is less commonly seen on the floor of the tunnel. We are convinced that it is the lower row of pores on either side of the tunnel which has been interpreted as multiple foramina. In some specimens one sees what at first glance appear to be poorly developed parachomata. In one section (Pl. 2, fig. 1), for example, on the lower side and just left of the tunnel, about midway between the center and outer surface of the shell, a row of dark spots superficially resemble parachomata. Careful inspection, however, reveals that these are not mounds of secondary material implanted on the outer surface of the spirotheca. Instead, the tops of the dark spots are level with the floor of the tunnel, which is the outer surface of the spirotheca, and their bases are level with the *inner* surface of the spirotheca. In other words, the semblance of parachomata is produced by an alternation of light and dark areas in the spirotheca resulting from partial recrystallization. This feature is also visible at right of the tunnel in the upper part of the same photograph. The spirothecal structure depicted by Kochansky-Devidé is quite obscure, and ordinarily the wall appears to consist of a thin tectum and a much thicker inner layer in which no minute structure is visible. These specimens are accompanied by rare individuals of *Neoschwagerina* and a *Chusenella* which Kochansky-Devidé (1965) has recently described as *C. velebitica*.

Sheng (1963) described two species from the Hoshan Formation of Kwangsi Province, China, as *Eoverbeekina sphaerulinaeformis* and *E. fusuiensis*, respectively. Both were said to possess a central tunnel, multiple foramina, and poorly developed parachomata. The photographs of *E. sphaerulinaeformis* show a species in which the preservation is so poor that many of the internal characters are only imperfectly visible. One photograph, however, (SHENG's pl. 24, fig. 3) shows in one place a row of large pores along the base of a septum, but no parachomata can be seen. The other species, *E. fusuiensis*, is illustrated by two photographs, one an axial section and the other a slightly oblique tangential section. In the first, septa coincide with the plane of the section in several places, and in each such place a row of large pores or foramina follows the base of the septum. In the areas where no septum is present in the plane of the section, however, no trace of parachomata is seen. Neither are any parachomata evident in the tangential section.

The type species of *Staffella*, *S. sphaerica* (ABICH), and all of the described species of *Eoverbeekina*, with possible exception of the Kwangsi specimens, are of about the same age, Middle Permian. All fall within the size range of 2 to 4 mm. diameter, all possess a subspherical, umbilicate shape, and all are invariably poorly preserved, even when associated fusulinid genera have normal preservation. The salient character of parachomata cannot be confirmed, either in the published photographs or in the topotype specimens of the two species we have been able to examine. From this we are forced to conclude that *Eoverbeekina* is a synonym of *Staffella*, the latter having a priority of eight years.

One other genus must be considered in this connection, *Nummulostegina* SCHUBERT. This genus was briefly described by SCHUBERT (1907), and the following year he redescribed it and established the first species, *N. velebitana*. His material came from the "*Schwagerina* dolomite" of Paklenica and contained, in addition, rare specimens of *Neoschwagerina*. The only illustrations were two drawings of external views which showed a discoidal form with a narrowly rounded periphery. SCHUBERT gave its axial length as 0.80 mm. and its sagittal diameter as 1.40 mm. In 1946 KAHLER restudied the sole specimen of this species preserved in SCHUBERT's collections, presumably the specimen from which SCHUBERT's drawings and measurements were made. It had been made into an abnormally thick parallel thin section which displayed 5 to 6 whorls. Judging by KAHLER's remarks and the photograph of the section which he published, the preservation is essentially the same as that of KOCHANSKY-DEVIDÉ's specimens from the same formation. This latter author, in describing *Eoverbeekina paklenicensis*, speculated on the possibility that *Nummulostegina velebitana* might have been based on an immature specimen of the species which she was studying, but rejected the idea on the basis of the much thinner discoidal shape shown in SCHUBERT's drawings.

For the present we are accepting the thesis that this difference in shape is sufficient to separate *Nummulostegina* and *Staffella*. If at some future date, however, the two genera should prove to be identical, the former would have a priority of some twenty years.

Illustrations.—Plate 2, figures 1-2; axial sections of topotypes of *Staffella paklenicensis* (KOCHANSKY-DEVIDÉ), ×40. [In figure 2 the section coincides with the penultimate septum, showing the double row of large septal pores, some of which would later coalesce to form the tunnel opening.] [Both from the Paklenica Dolomite, Velebit, Jugoslavia. All figures are unretouched photographs.]

STAFFELLA TUNETANA Skinner & Wilde, n. sp.

Staffella sp. aff. *S. haymanaensis* GLINTZBOECKEL & RABATÉ, 1964, Internat. Sed. Petrogr. Ser., v. 7, pl. 43, fig. 1; pl. 44, fig. 2b.

Shell small, thickly discoidal to subspherical, with broadly rounded periphery; 1st 4 volutions more lenticular in shape, with bluntly angular periphery, mature specimens with 9 to 11 whorls 1.64 to 2.01 mm. in axial length and 2.18 to 2.51 mm. in sagittal diameter; form ratio 0.69 to 0.80.

Spirotheca composed of tectum and thicker inner layer analogous to diaphanotheca of some other fusulinids. [Ordinarily this inner layer appears to be structureless, but in some specimens fine mural pores can be seen traversing it.] Thickness of spirotheca 23 to 32 μ in 8th volution. Septa unfluted throughout their length, numbering 7 to 9 in 1st whorl, 12 to 15 in 2nd, 13 to 16 in 3rd, 16 to 18 in 4th, 17 to 21 in 5th, 20 to 23 in 6th, 21 to 24 in 7th, and 25 to 28 in 8th; row of large septal pores located along basal margin of each septum (Pl. 3, figs. 2-3; Pl. 4, figs. 3-4) in such manner as to produce semblance of multiple foramina alternating with parachomata, latter, however, being merely septal material that separates pores and apparent only when septum lies within plane of section; tangential and oblique sections show no trace of parachomata.

Proloculus minute, with outside diameter 61 to 98 μ, averaging about 75 μ. Tunnel low and narrow; tunnel angle 16 to 22 degrees in 7th whorl, 16 to 25 degrees in 8th, 21 to 24 degrees in 9th, and about 26 degrees in 10th. Chomata low and asymmetrical, being much steeper on side adjacent to tunnel, not conspicuous.

Illustrations.—Plate 2, figures 3-6; 3-4, axial section of holotype, ×10, ×30; 5-6, axial sections of paratypes, ×30.——Plate 3, figures 1-6; 1-3, axial sections of paratypes, ×30; 4-6, sagittal sections of paratypes, ×30. [In figures 2 and 3 the semblance of multiple foramina and parachomata is produced by a row of large septal pores along the base of each septum. Note that these appear only at those spots in which a septum coincides with the plane of the section. True parachomata would also be evident between septa. Moreover, no traces of parachomata are visible in tangential or oblique sections.]——Plate 4, figures 1-4; 1-2, sagittal sections of paratypes, ×30; 3-4, parts of specimen shown in Plate 3, figure 3, enlarged, ×100. [All specimens from collection Tu-21. All figures are unretouched photographs.]

Discussion.—*Staffella tunetana* SKINNER & WILDE, n. sp., resembles *S. haymanaensis* CIRY, from Turkey, but differs from that species in its slightly larger size, more numerous whorls, and markedly smaller form ratio. It differs from *S. ciryi* SKINNER & WILDE, n. sp., in its larger size, more numerous whorls, and more angular periphery of its inner whorls.

This species, like nearly all members of the genus, displays a mode of preservation which often obscures the smaller details of internal structure. In thin sections the spirotheca has a resinous, translucent appearance with light amber color. Even so, our specimens are better preserved than most examples of *Staffela*. Surprisingly, photographs frequently show minute details more plainly than they appear when viewed under the microscope.

Occurrence.—We have found this species only in collection Tu-21, from a depth of 2,241.4 to 2,243.7 meters in the Bir Soltane well. *Afghanella* occurs both above and below it.

STAFFELLA CIRYI Skinner & Wilde, n. sp.

Shell small, subspherical, slightly umbilicate, with broadly rounded periphery; inner whorls thickly discoidal with rounded periphery; mature individuals have 7.5 to 8.5 volutions, 1.34 to 1.67 mm. in axial length and 1.78 to 2.09 mm. in sagittal diameter; form ratio 0.73 to 0.83.

Spirotheca composed of tectum and thicker inner layer analogous to diaphanotheca of some other fusulinids, inner layer commonly appearing structureless in *Staffella*, but specimens before us are unusually well preserved and differential natural staining has accentuated the minute structure; both layers of wall traversed by minute mural pores (Pl. 6, figs. 3, 4). In 7th volution spirotheca varies from 33 to 45 μ in thickness, averaging about 37 μ. Septa unfluted, numbering 8 to 9 in 1st whorl, 14 in 2nd, 15 to 17 in 3rd, 17 to 21 in 4th, 17 to 24 in 5th, 21 to 25 in 6th, 24 to 27 in 7th, and 27 to 30 in 8th; few large septal pores observed along bases of septa, but these are neither numerous nor conspicuous.

Proloculus minute, with outside diameter 66 to 109 μ, averaging about 86 μ. Tunnel narrow and about one-third to one-half as high as chambers; tunnel angle 17 to 25 degrees in 6th volution, 21 to 28 degrees in 7th, and 16 to 23 degrees in 8th. Chomata low and asymmetrical, being much steeper on side adjacent to tunnel.

Illustrations.—Plate 5, figures 1-9; 1-2, axial section of holotype, ×10, ×30; 3-7, axial sections of paratypes, ×30; 8, tangential section of paratype, ×30; 9, sagittal section of paratype, ×30. ——Plate 6, figures 1-4; 1, sagittal section of paratype, ×30; 2, sagittal section of unusually large paratype, ×30; 3-4, parts of specimen shown in figure 2, enlarged, ×100, to show mural pores of spirotheca. [All specimens from collection Tu-24. All figures are unretouched photographs.]

Discussion.—*Staffella ciryi* SKINNER & WILDE, n. sp., is similar to *S. tunetana* SKINNER & WILDE, n. sp., but differs from the latter in its smaller size, less numerous whorls, less conspicuous septal pores, and more rounded periphery of its inner volutions. Our specimens are remarkably well preserved for a member of this genus, and as a result we are able to show the minute structure of the spirotheca quite clearly. In this respect the only comparable specimens of *Staffella* known to us are ones figured by KOCHANSKY-DEVIDÉ (1965) as *Staffella elegantula* (pl. 3, fig. 3) which show a similar wall structure, but we believe it is more distinct in our specimens. *S. ciryi* is similar to *S. elegantula*, but differs from the latter in its smaller proloculus and less conspicuous chomata. This species is named for Dr. RAYMOND CIRY.

Occurrence.—We have found *Staffella ciryi* only in collection Tu-24, from a depth of 2,497.5 meters in the Bir Soltane well. *Afghanella* occurs both above and below it, and *Verbeekina* has been found in a lower zone.

Family FUSULINIDAE von Möller, 1878

Subfamily BOULTONIINAE Skinner & Wilde, 1954

Genus DUNBARULA Ciry, 1948

DUNBARULA MATHIEUI Ciry

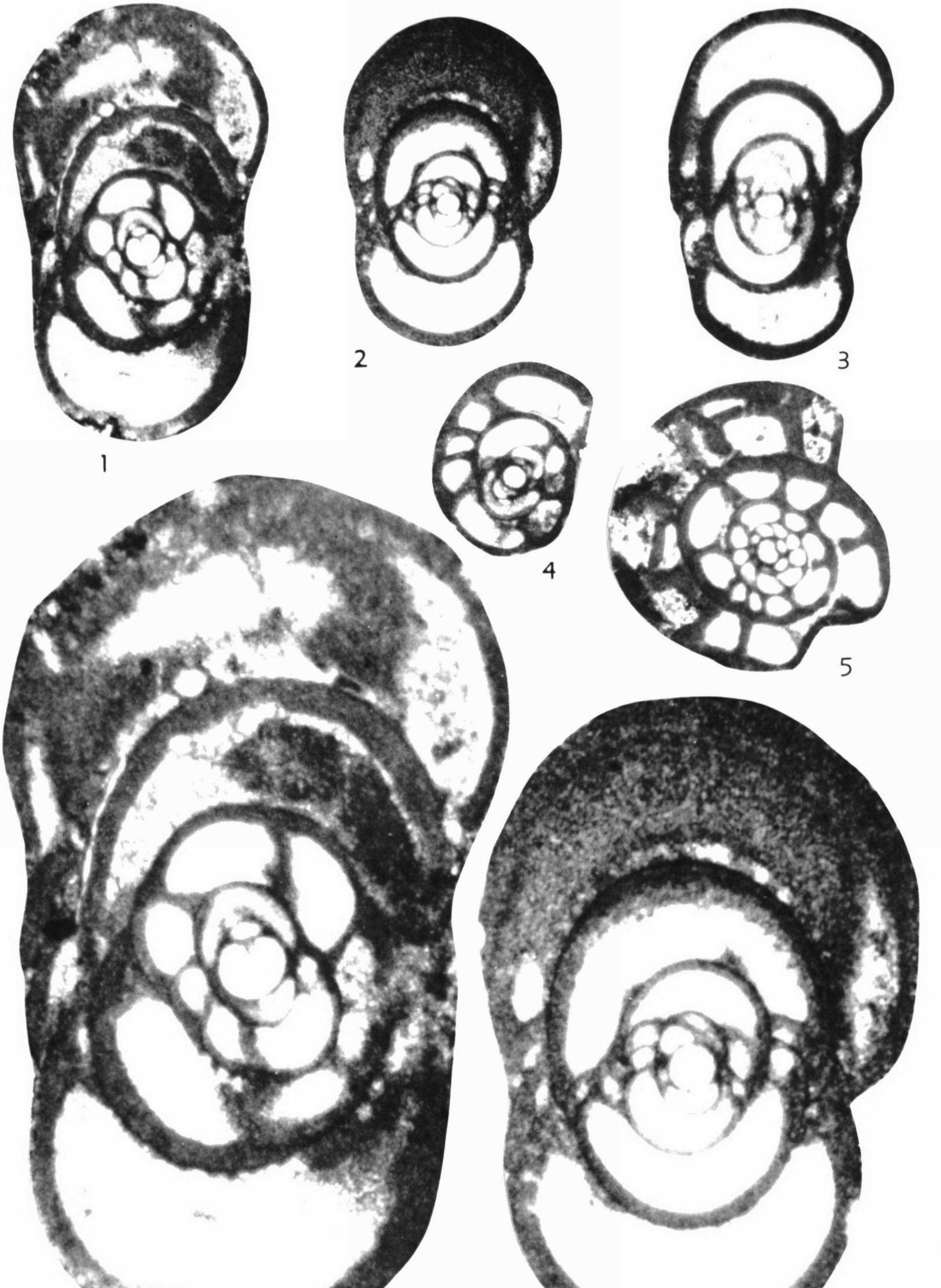
Dunbarula mathieui CIRY, 1948, Bull. Sci. de Bourgogne, v. 11, p. 103-110, pl. 1, figs. 1-13.

Shell small, highly variable in shape, ranging from ellipsoidal, through thickly subcylindrical, to slender subcylindrical, poles bluntly rounded; inner 2.5 to 4 whorls constituting discoidal or lenticular juvenarium coiled nearly at right angle to later volutions, periphery of juvenarium narrowly rounded to bluntly angular; mature topotypes with 5 to 6 volutions 1.79 to 2.68 mm. in length and 0.97 to 1.24 mm. in diameter; form ratio 1.63 to 2.65. [Specimens from another locality (Tu-14) tend to be somewhat larger, but display the same marked variation in shape and proportions. These specimens have the same number of volutions as topotypes, but measure 1.98 to 2.91 mm. in length and 1.23 to 1.69 mm. in diameter. Their form ratio varies from 1.33 to 2.12, indicating generally thicker proportions.]

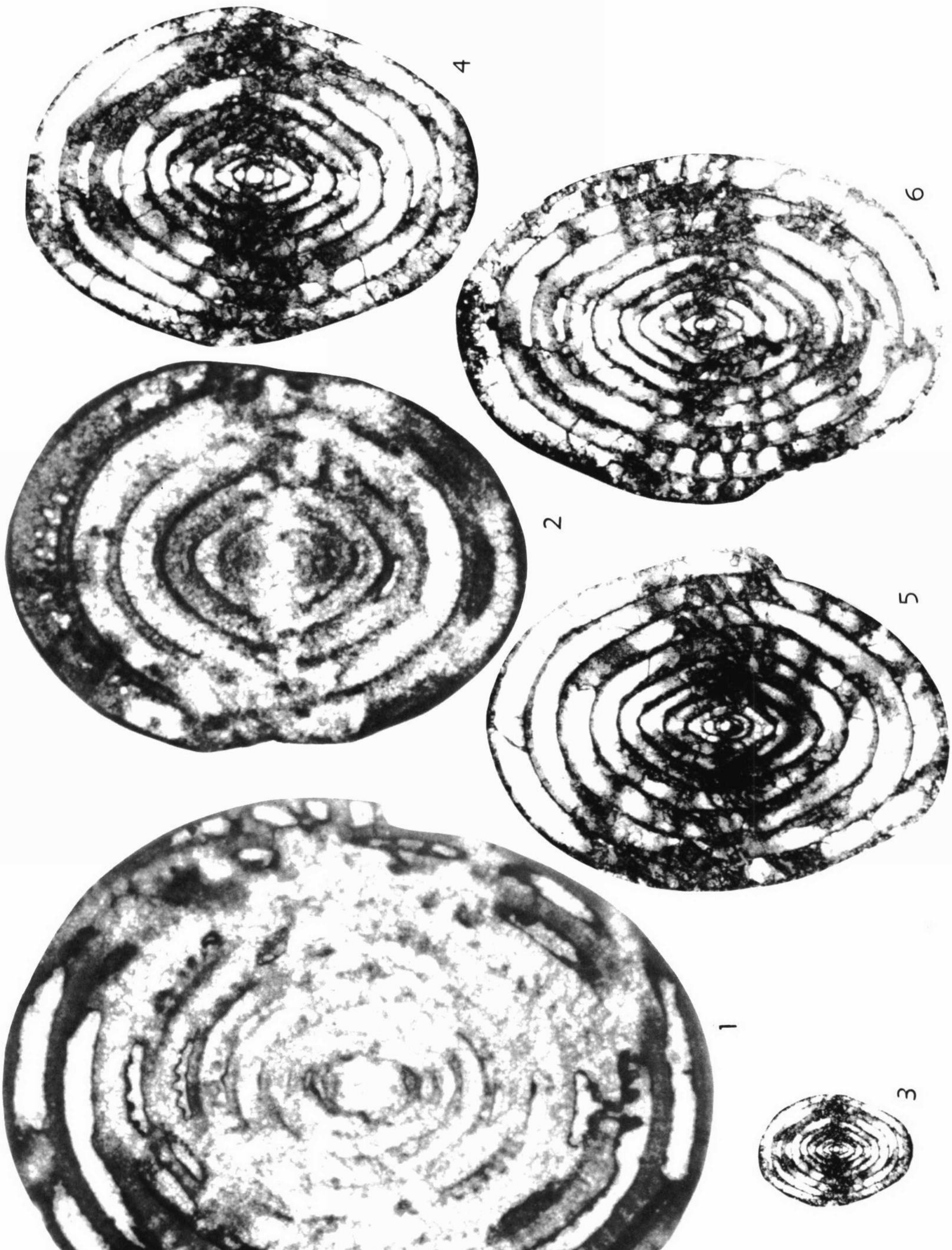
Spirotheca composed of tectum and diaphanotheca measuring 20 to 29 μ in thickness in 5th volution; in vicinity of tunnel thin secondary deposits may be present on both inner and outer surfaces of spirotheca, but these are related to chomata rather than being true tectoria, and they are absent in lateral portions of shell. [Ordinarily, fine mural pores traversing wall are only poorly visible in outer whorls (Pl. 8, fig. 7), but in our specimens from collection Tu-14 the mural pores have been filled with iron oxide and appear as dark lines crossing the spirotheca (Pl. 11, figs. 1-3; Pl. 12, figs. 1, 2; Pl. 13, figs. 1, 2; Pl. 14, figs. 1, 2). When seen end-on in tangential sections these pores appear as irregularly rounded dark spots (Pl. 11, fig. 2; Pl. 13, fig. 2).] Septa composed of same elements as spirotheca, but mural pores disappear at about point where spirotheca bends inward to form septum (Pl. 14, fig. 2). [In this respect the inner layer of the septum resembles the pyknotheca of schwagerinids.] In inner whorls layers of secondary material of about same density coat both anterior and posterior faces of septa (Pl. 14, fig. 1), producing marked thickening of septa, which are strongly fluted from pole to pole, with septal folds reaching nearly to tops of chambers; septal pores abundant and large, commonly appearing as dark spots as result of having been plugged with secondary material (Pl. 9, fig. 4; Pl. 10, fig. 2; Pl. 11, figs. 1, 3; Pl. 12, fig. 1), pores somewhat constricted in passing through septum, flaring out at septal faces (Pl. 13, fig. 1); septa number 7 to 10 in 1st whorl, 10 to 15 in 2nd, 12 to 16 in 3rd, 16 to 19 in 4th, 19 to 25 in 5th, and about 28 in 6th.

Proloculus minute, with outside diameter 33 to 62 μ. Tunnel low and rather narrow in early whorls, but widening abruptly in 5th volution; tunnel angle 22 to 29 degrees in 4th whorl, 38 to 51 degrees in 5th, and 47 to 56 degrees in 6th. Although chomata are low, seldom exceeding one-third of height of chambers, they are rather conspicuous because of thinness of spirotheca.

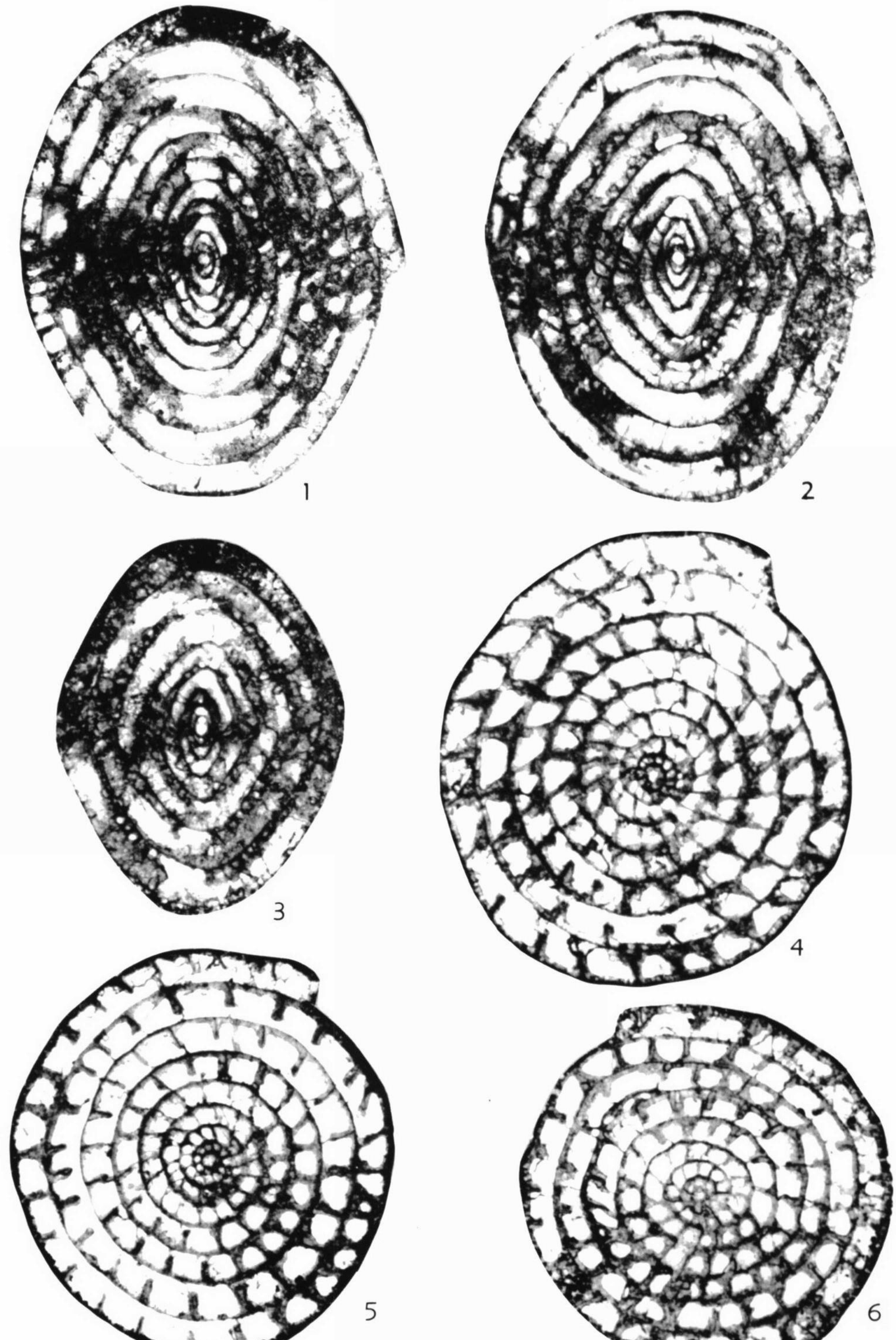
Illustrations.—Plate 7, figures 1-6; axial sections of topotypes, $\times 40$. [All from collection Tu-1.]——Plate 8, figures 1-7; 1-3, axial sections of topotypes, $\times 40$, showing extremes of variation in shape and proportion; 4-6, sagittal sections of topotypes, $\times 40$; 7, part of specimen shown in figure 4, enlarged, $\times 100$, to show spirothecal structure as it ordinarily appears. [All from collection Tu-1.]——Plate 9, figures 1-4; 1-4, axial sections, $\times 40$, showing variability of the species. [All from collection Tu-14.]——Plate 10, figures 1-5; 1-2, axial sections, $\times 40$; 3-5, sagittal sections, $\times 40$. [All from collection Tu-14.]——Plate 11, figures 1-3; 1, tangential section cutting last two septa and antetheca (abundant septal pores and much smaller mural pores appearing dark because they have been filled with iron oxide), $\times 100$; 2, another tangential section showing the mural pores end-on some places, $\times 100$; 3, part of specimen shown in Plate 9, figure 4, enlarged, $\times 100$, to show iron-stained mural pores. [All from col-



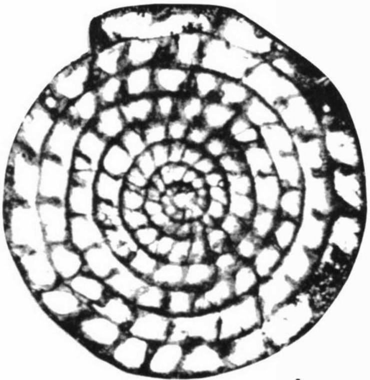
Kahlerina africana



Staffella paklenicensis, 1-2 Staffella tunetana, 3-6



Staffella tunetana



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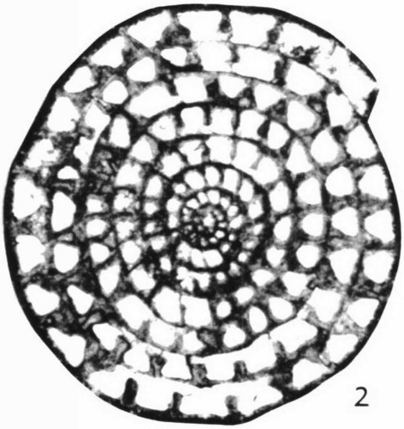

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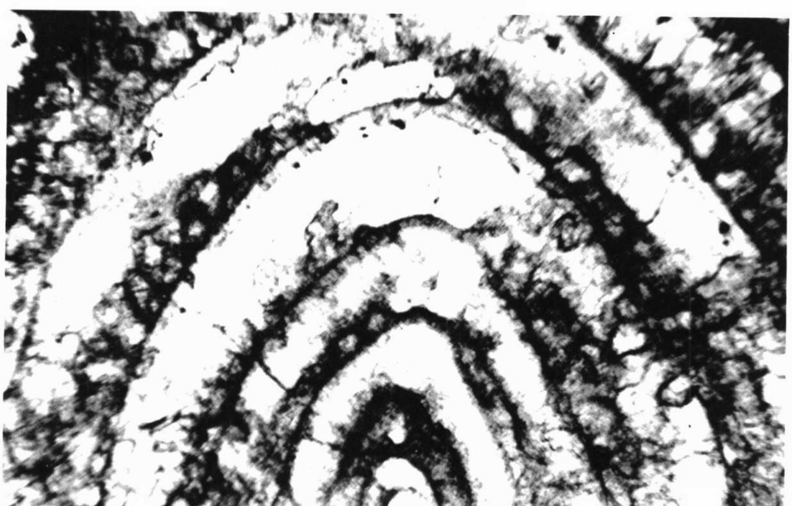

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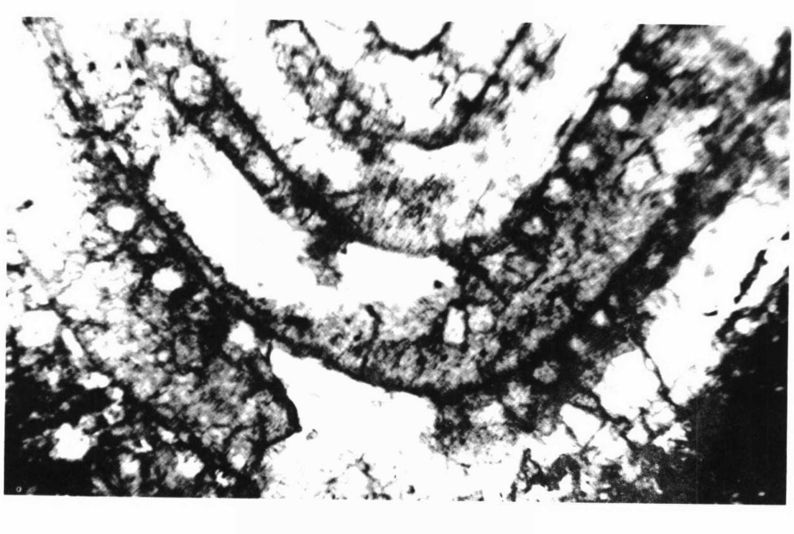

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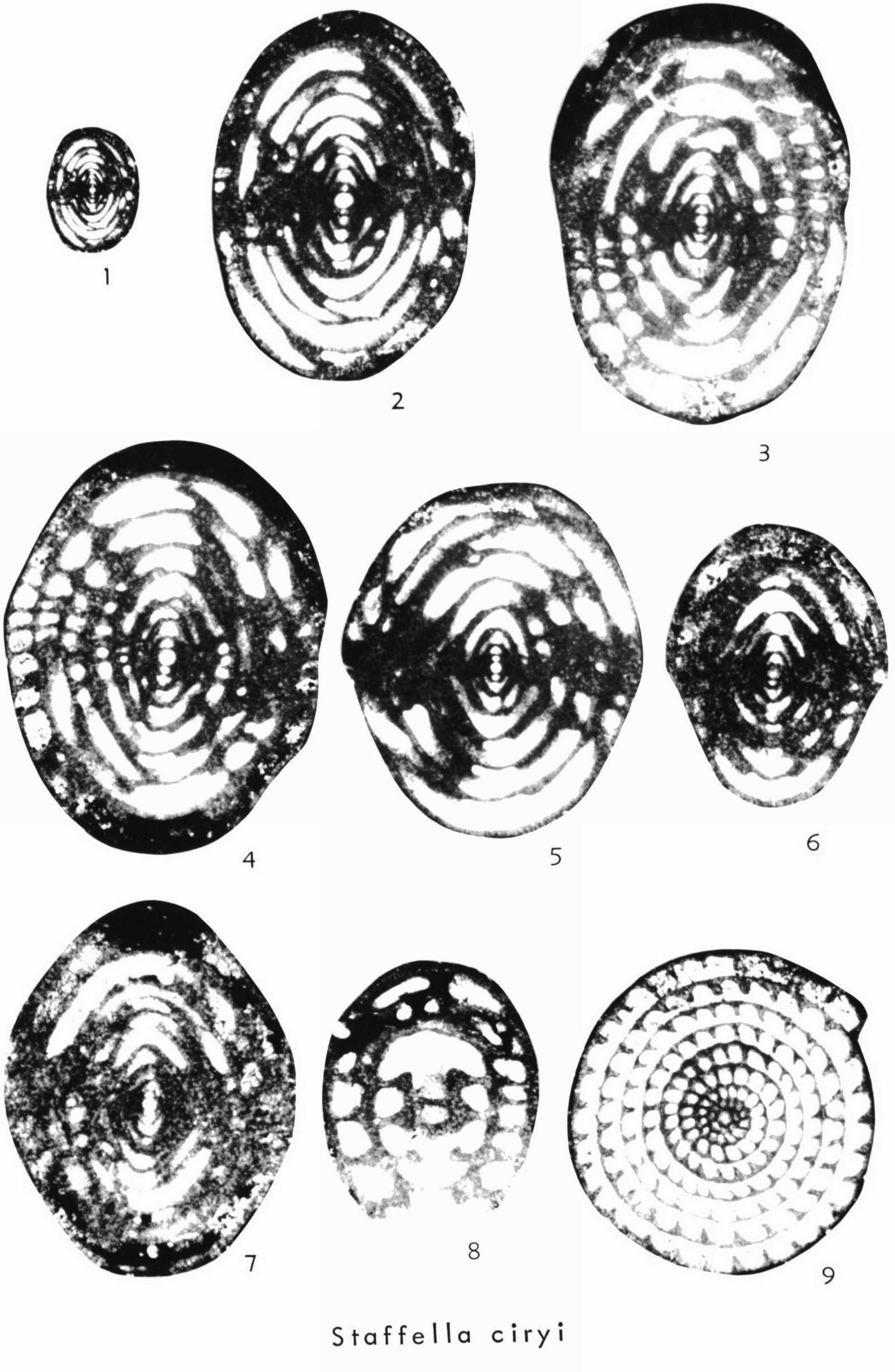
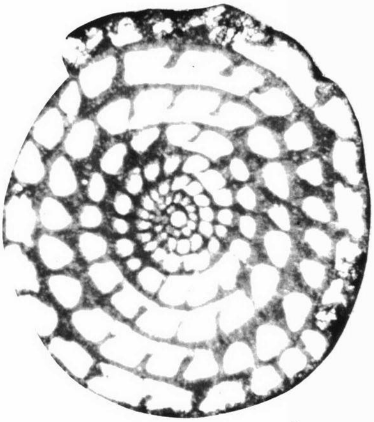


Staffella ciryi



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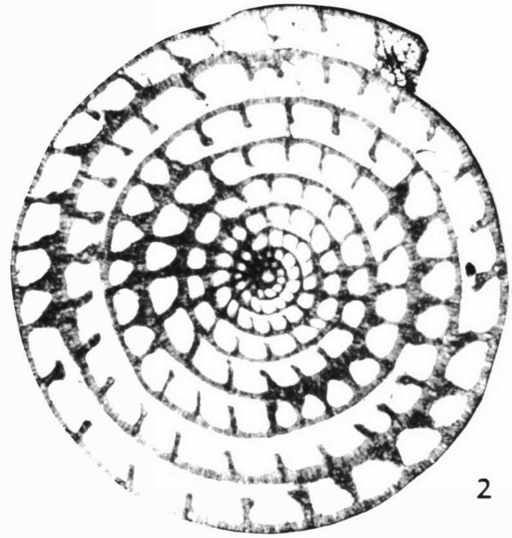

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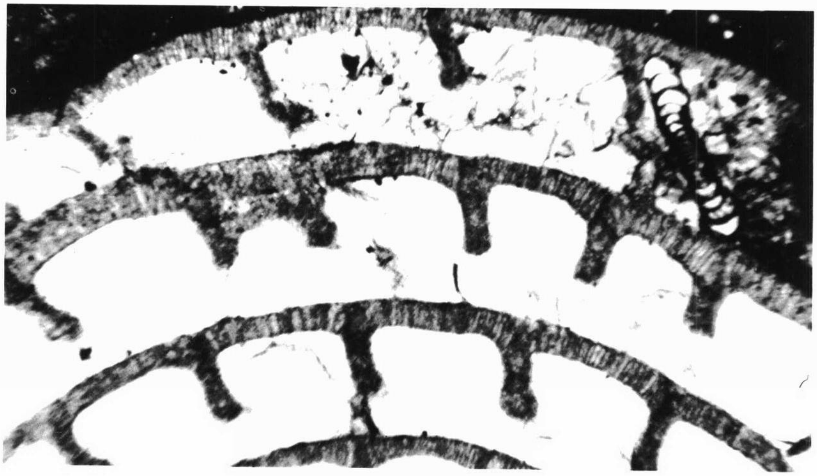

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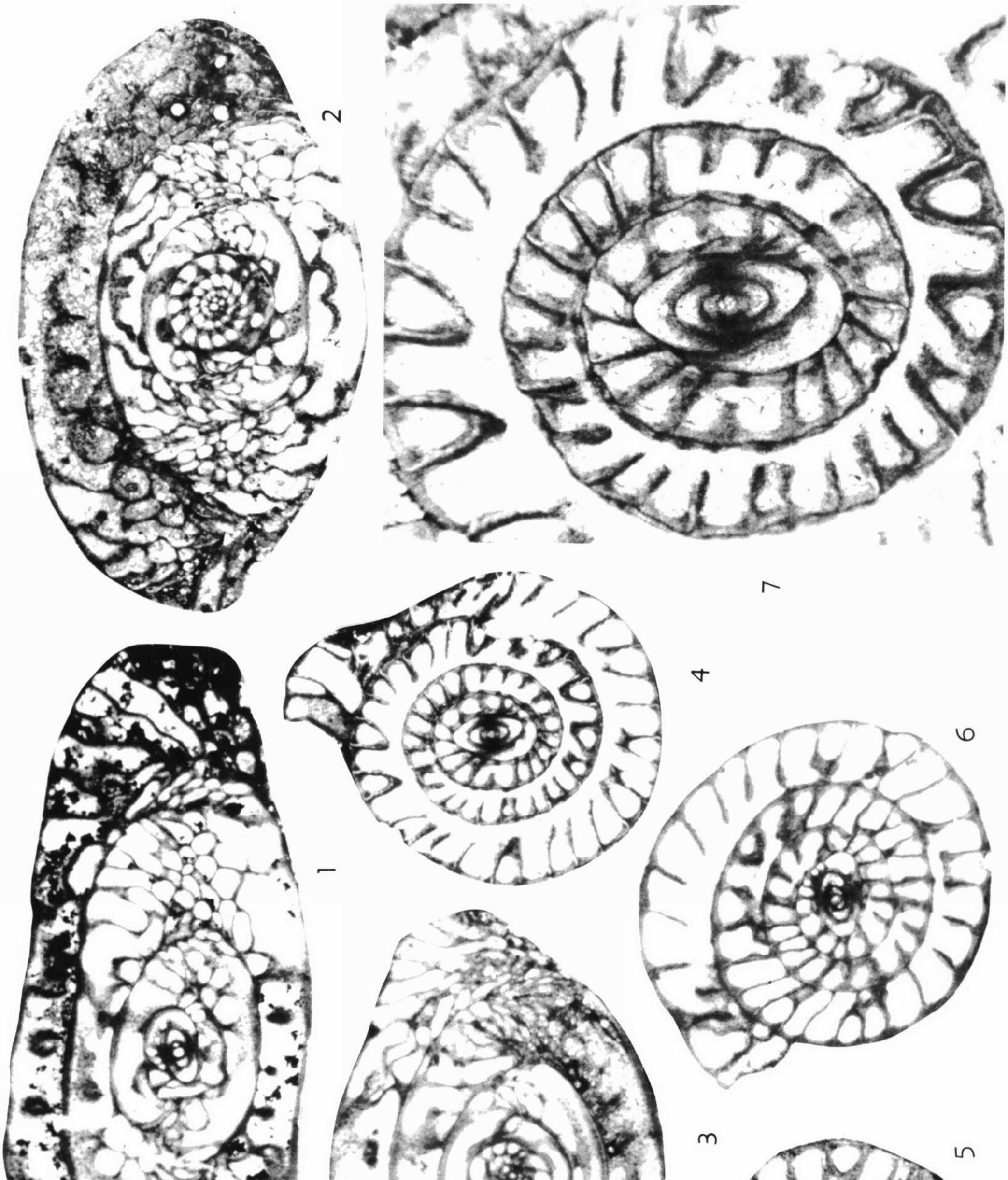
Staffella ciryi

Dunbarula mathieui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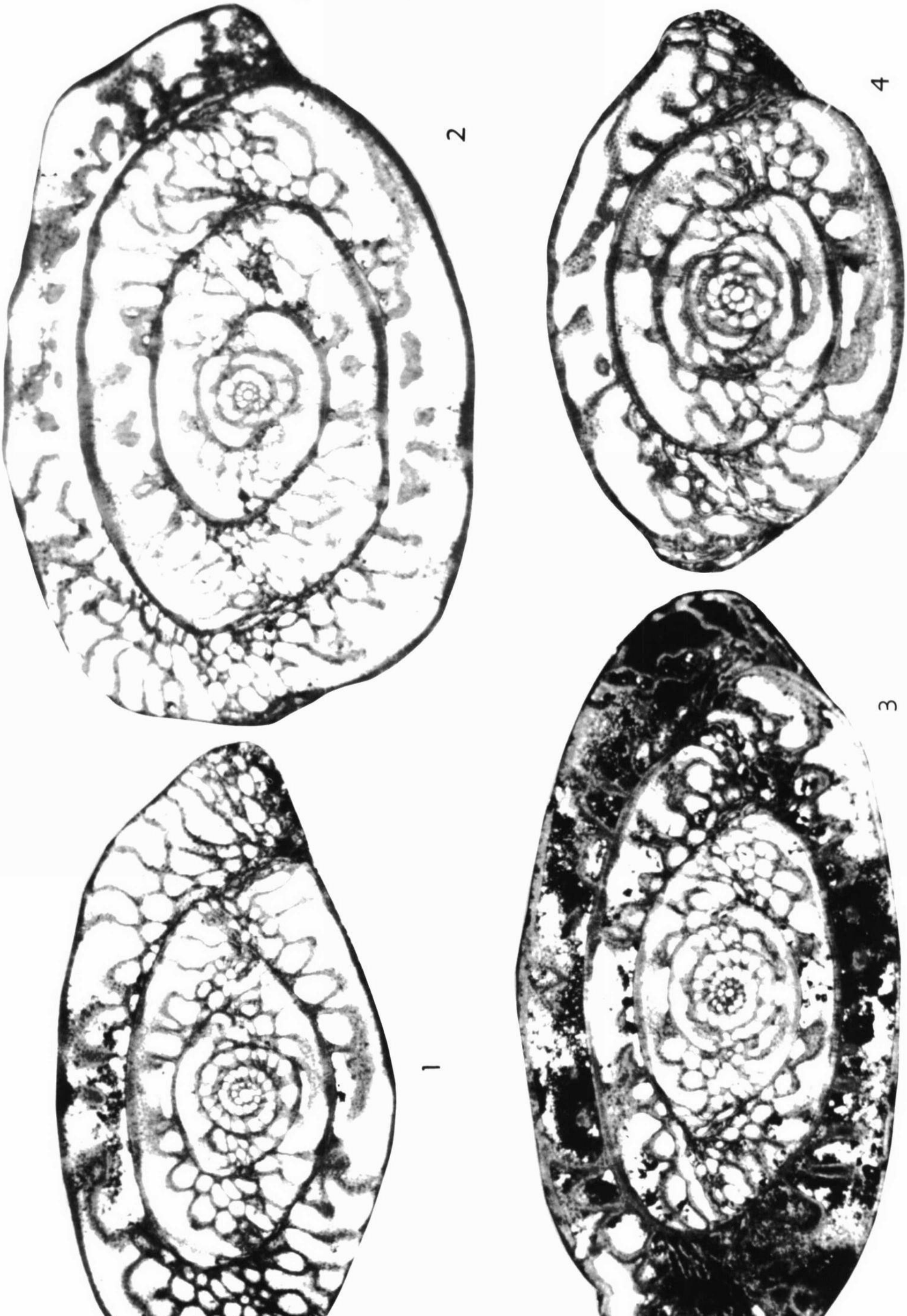

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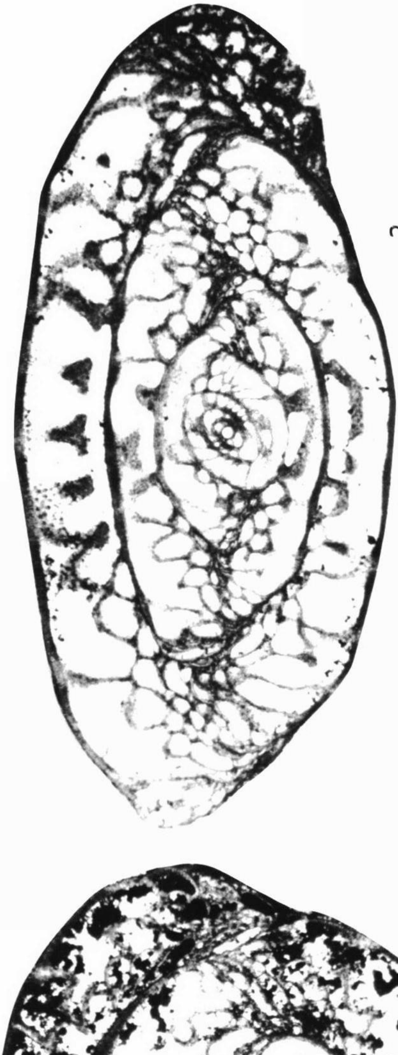

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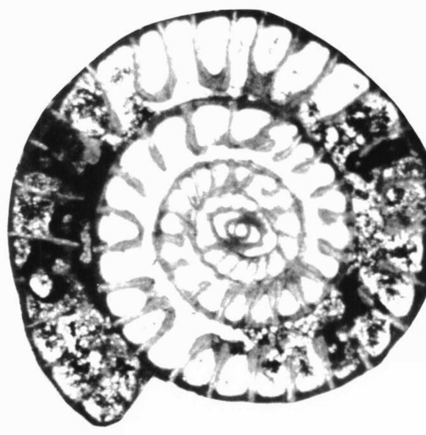

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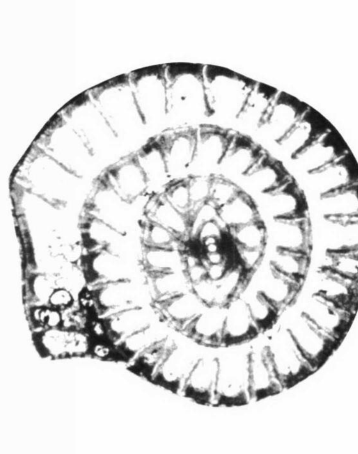

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Dunbarula mathieui

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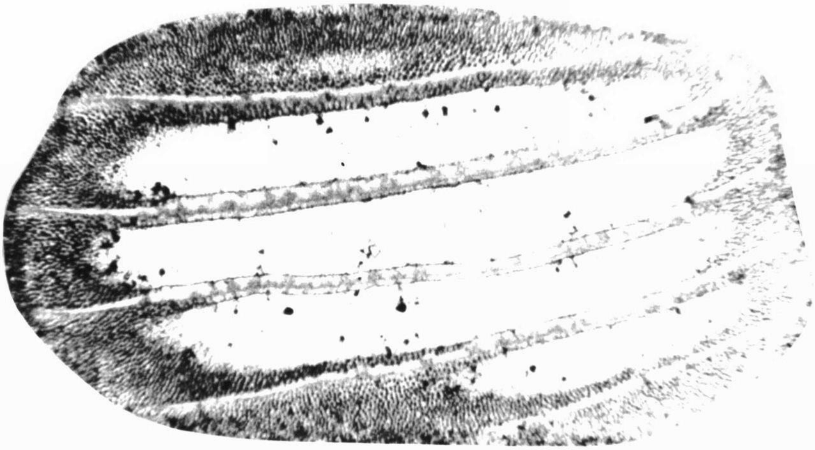

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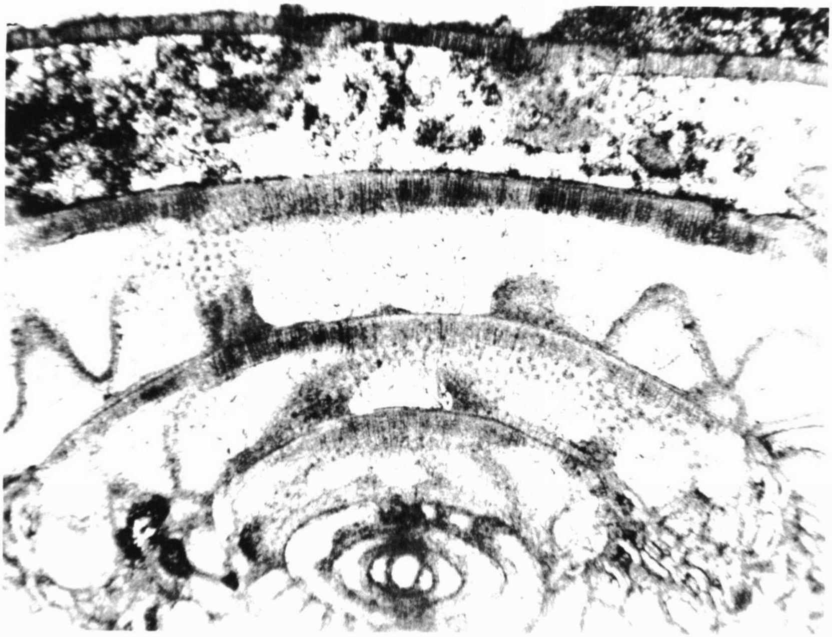

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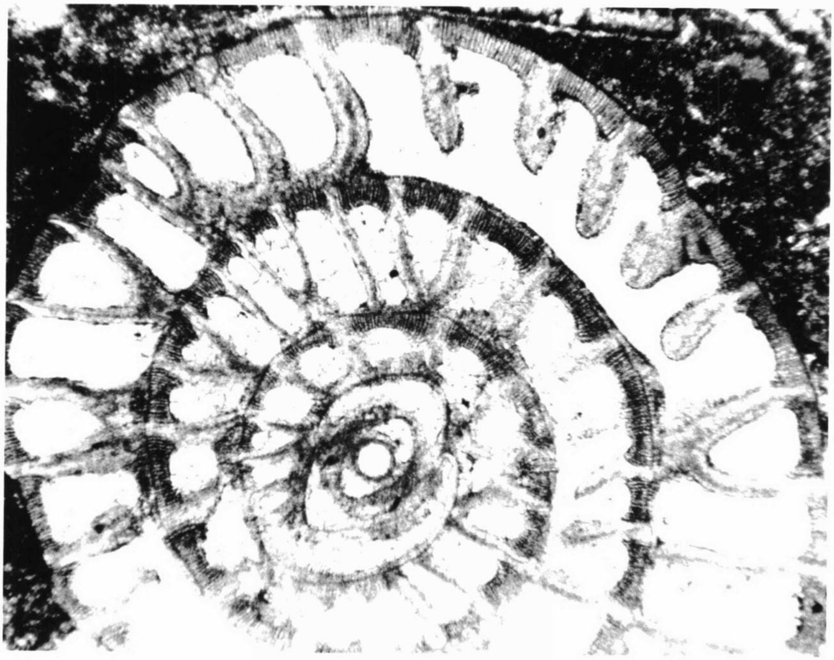

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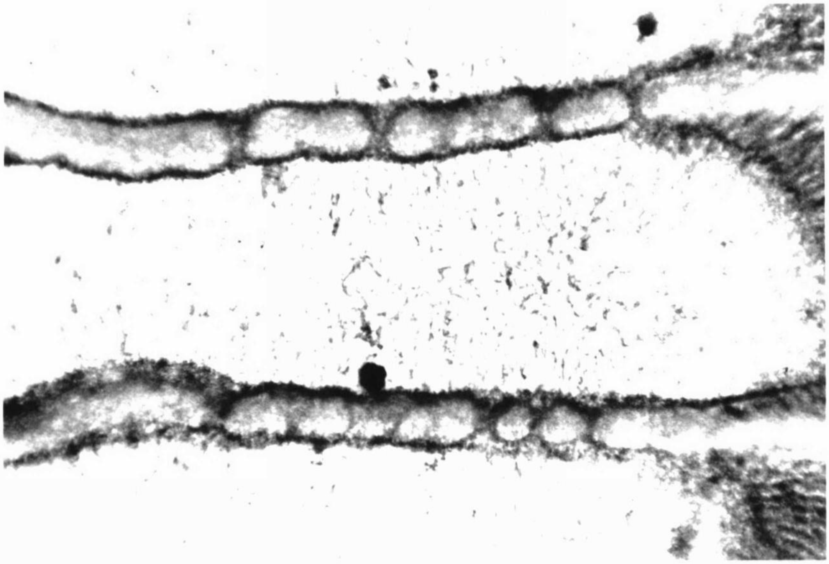

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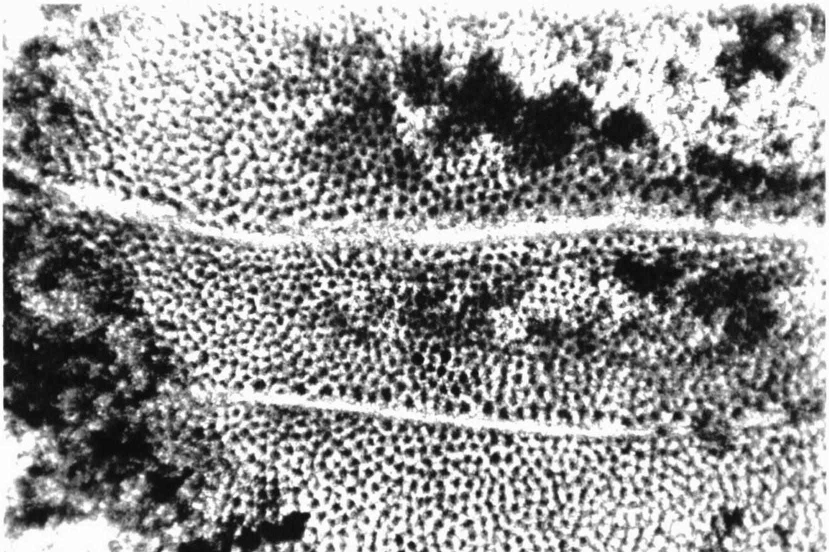

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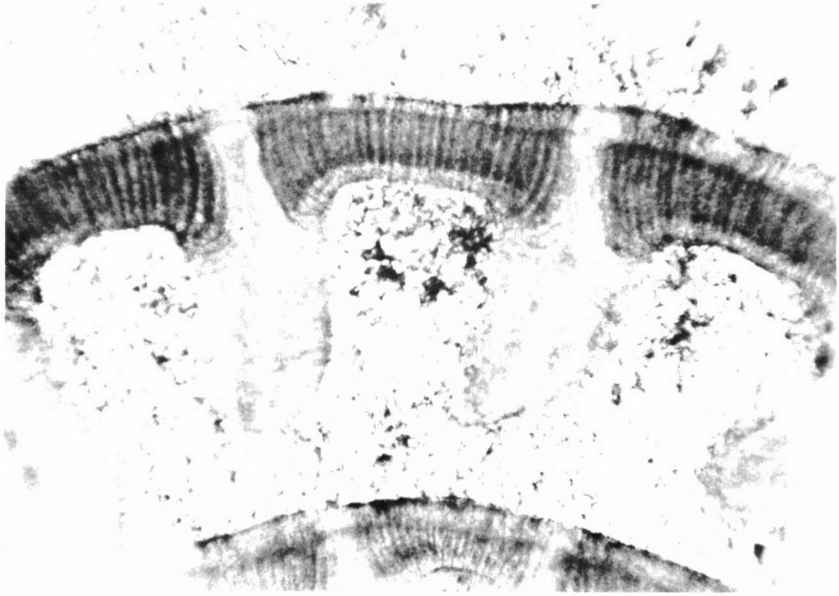

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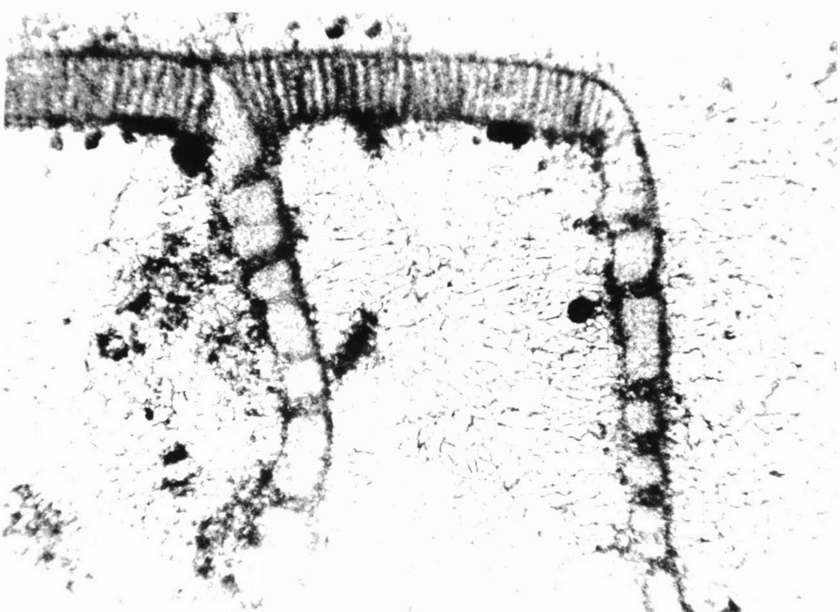

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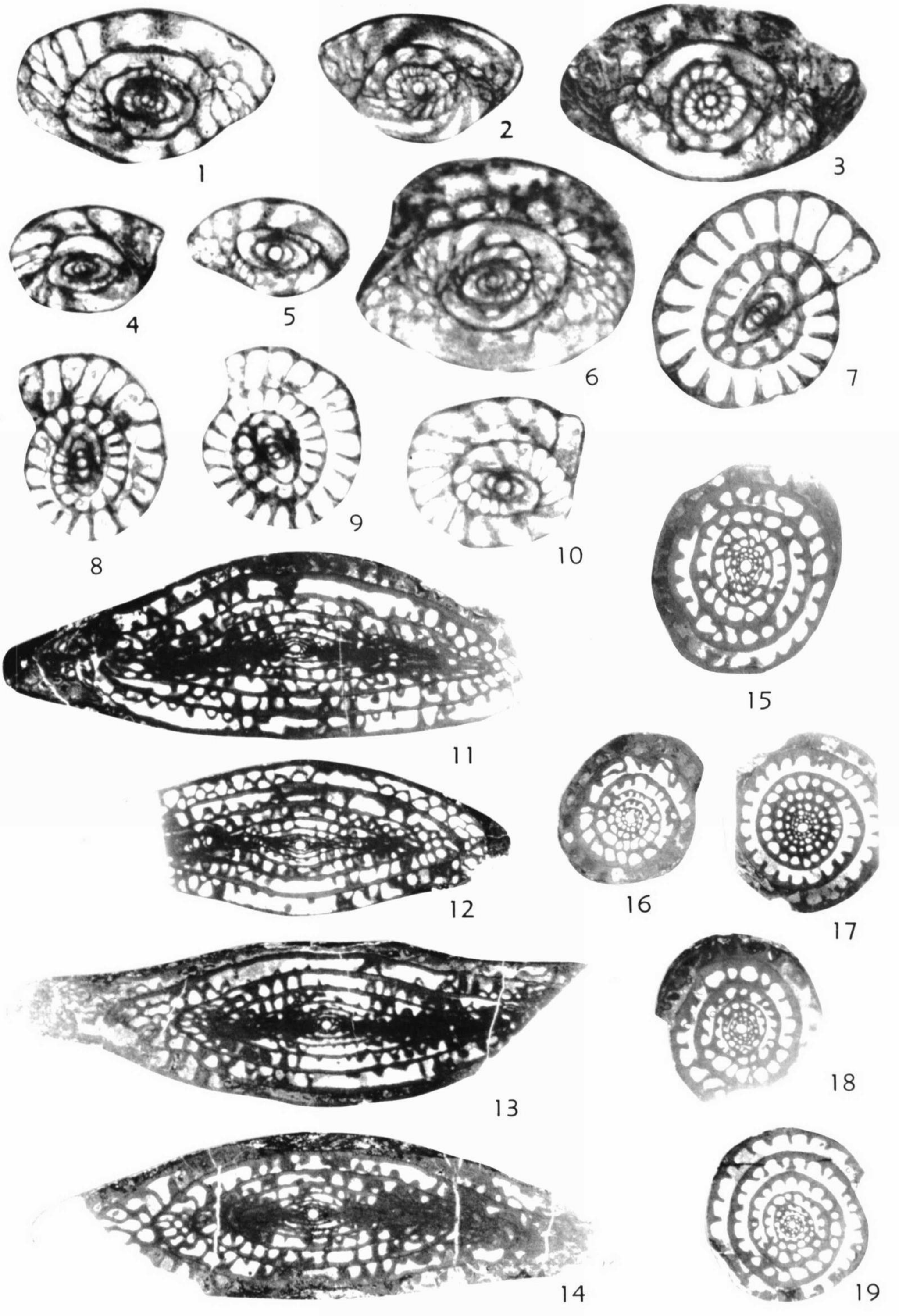
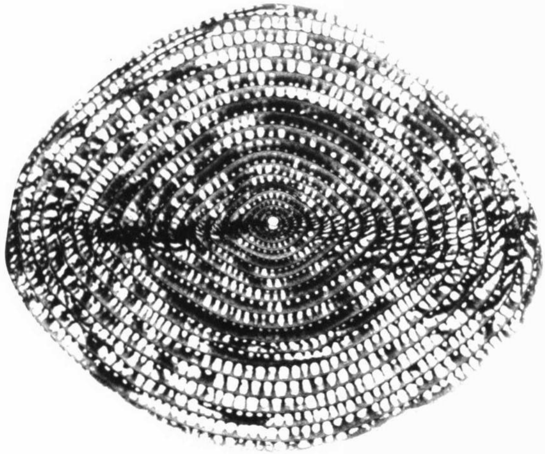


Dunbarula nana, 1-10 *Chusenella rabatei*, 11-19



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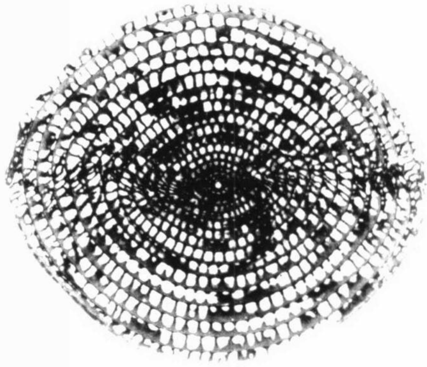

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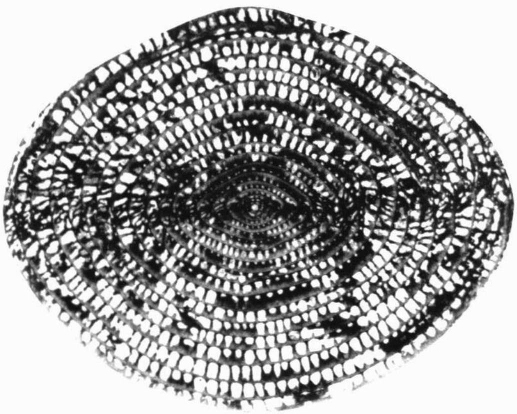

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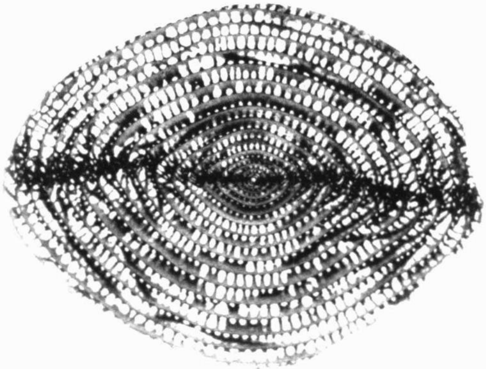

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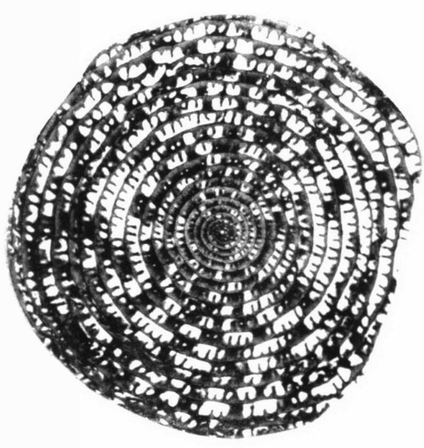

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Neoschwagerina glintzboeckeli

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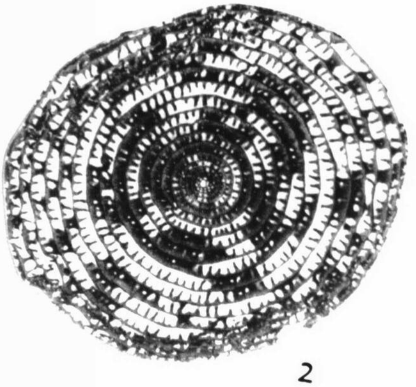

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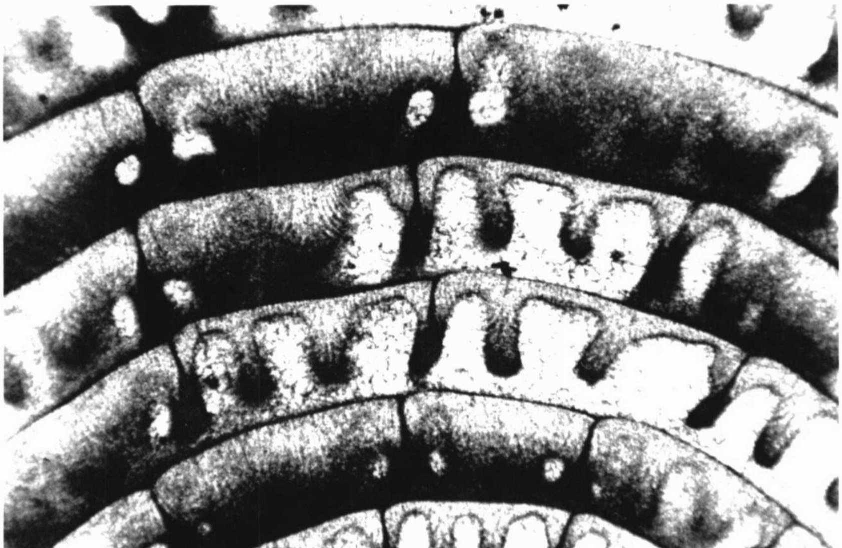

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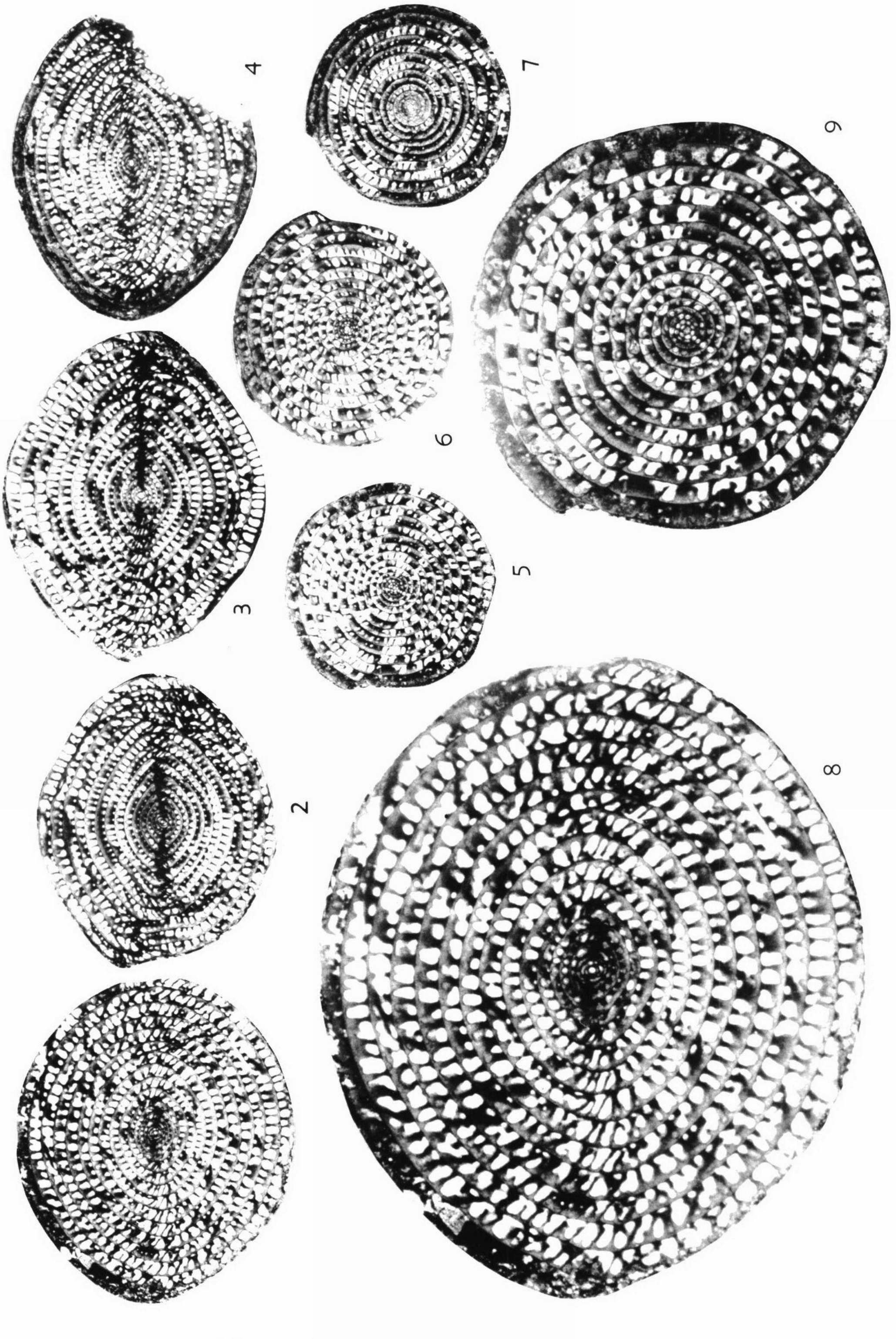
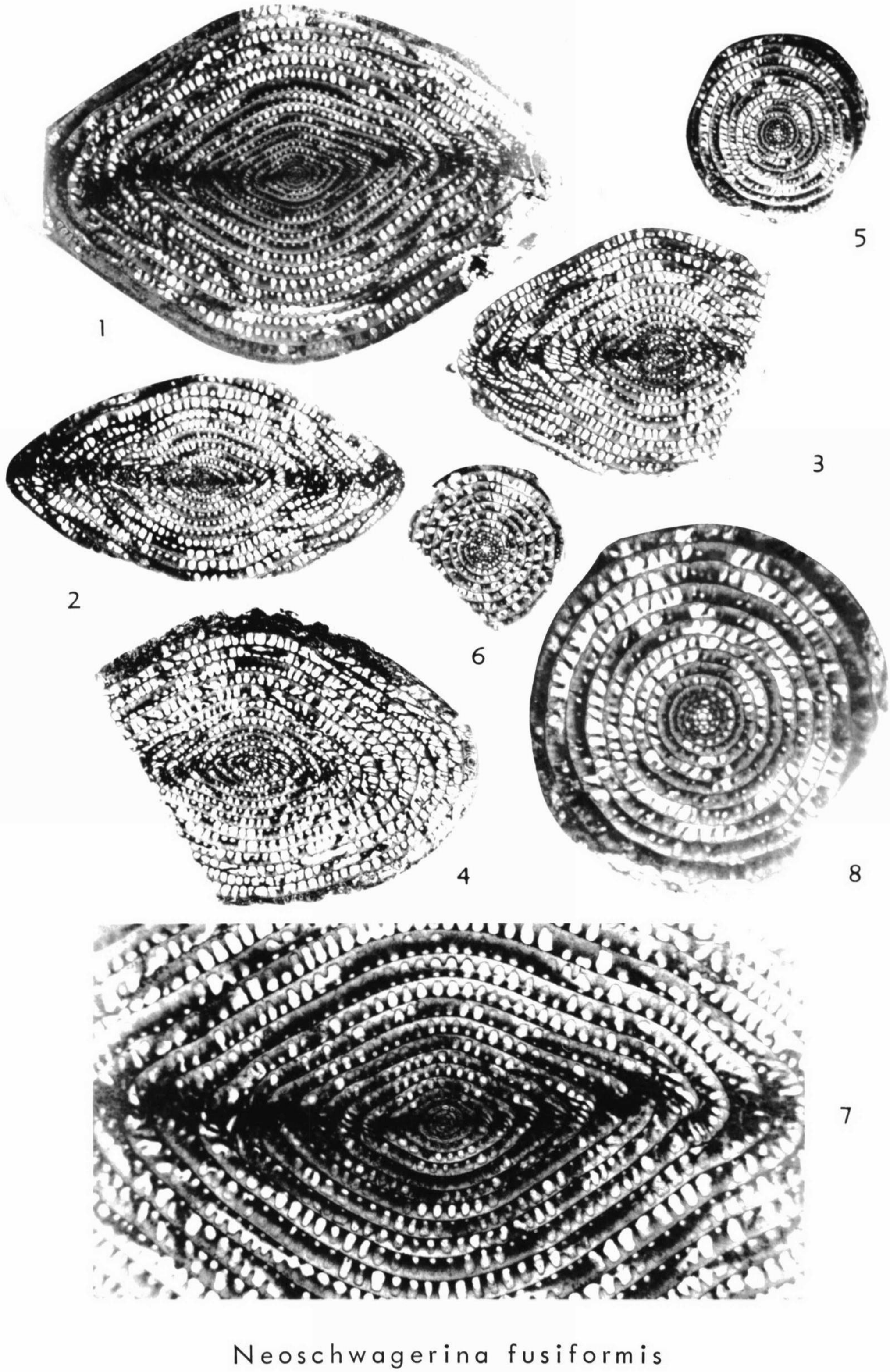
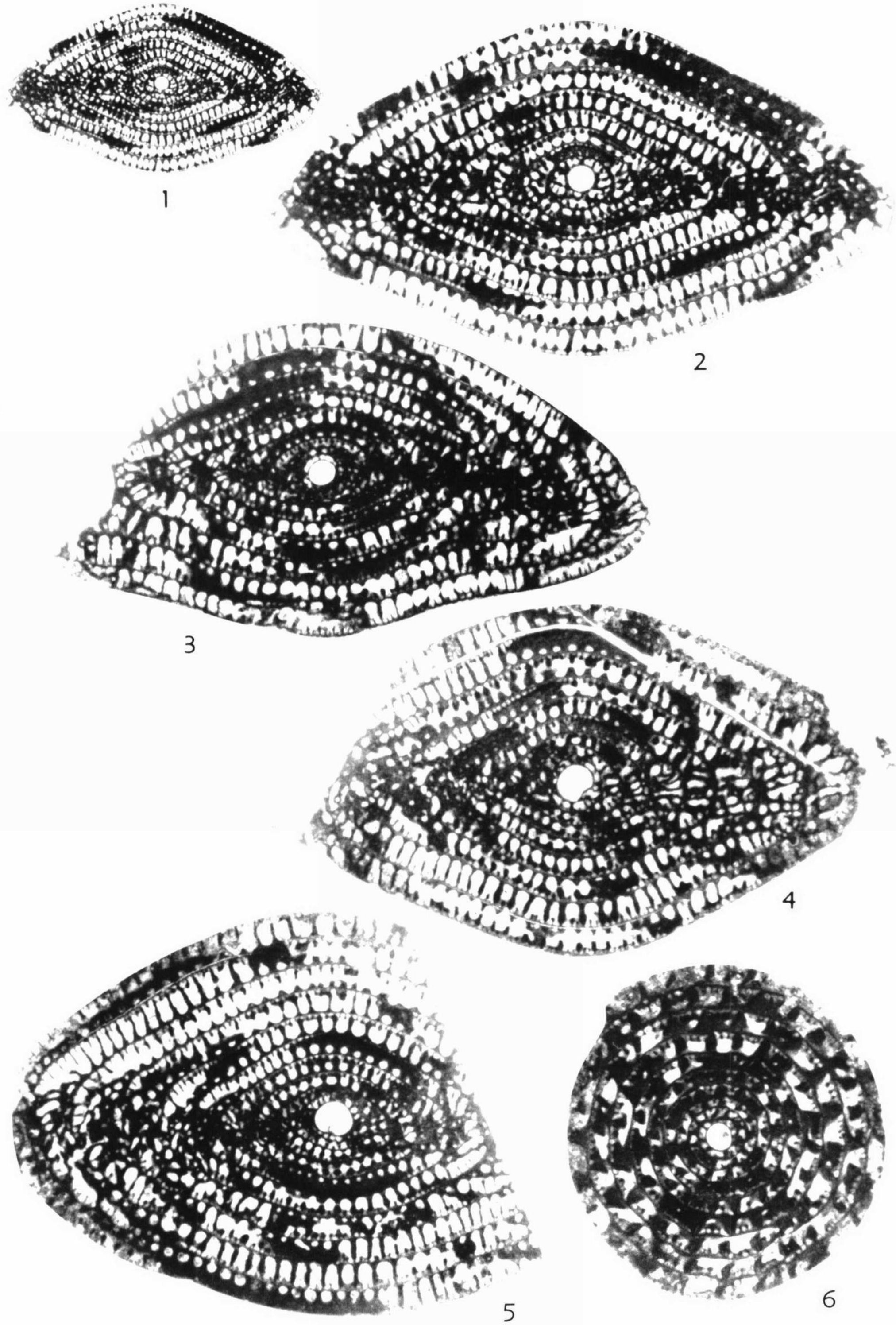


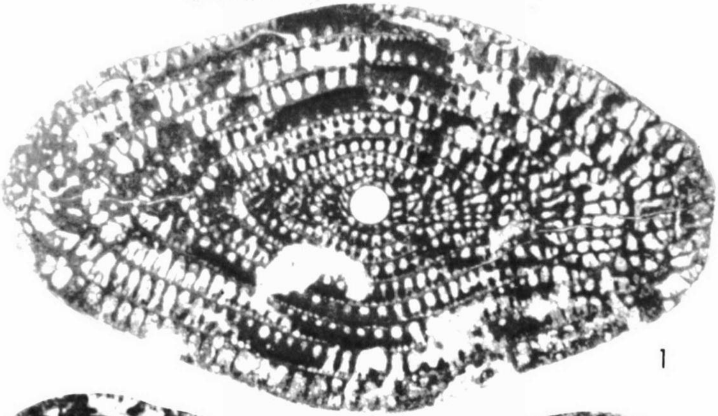
Neoschwagerina tebagaensis



Neoschwagerina fusiformis



Afghanella robbinsae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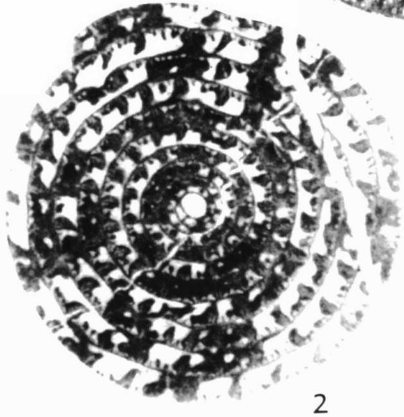
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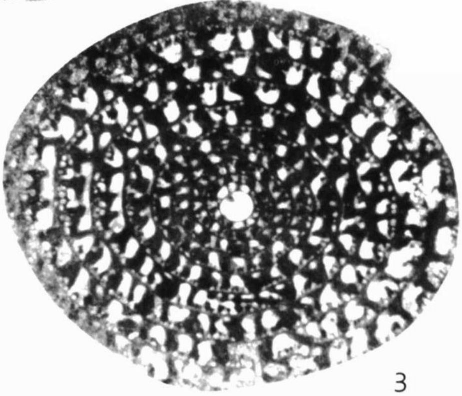
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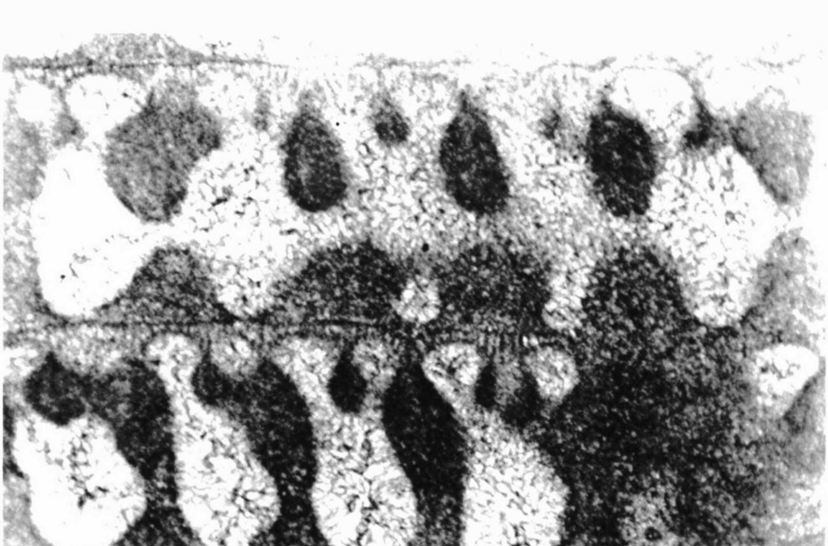
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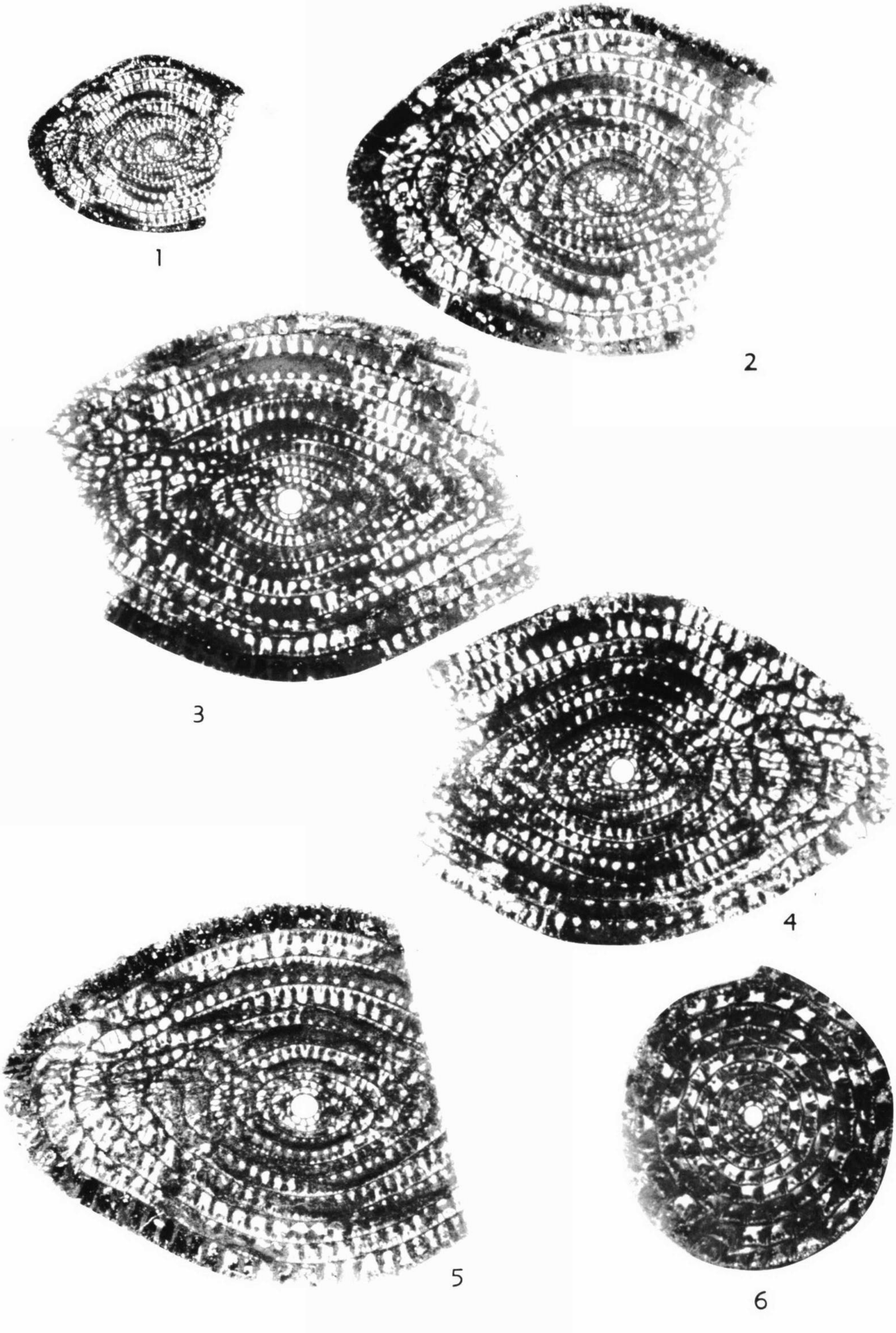
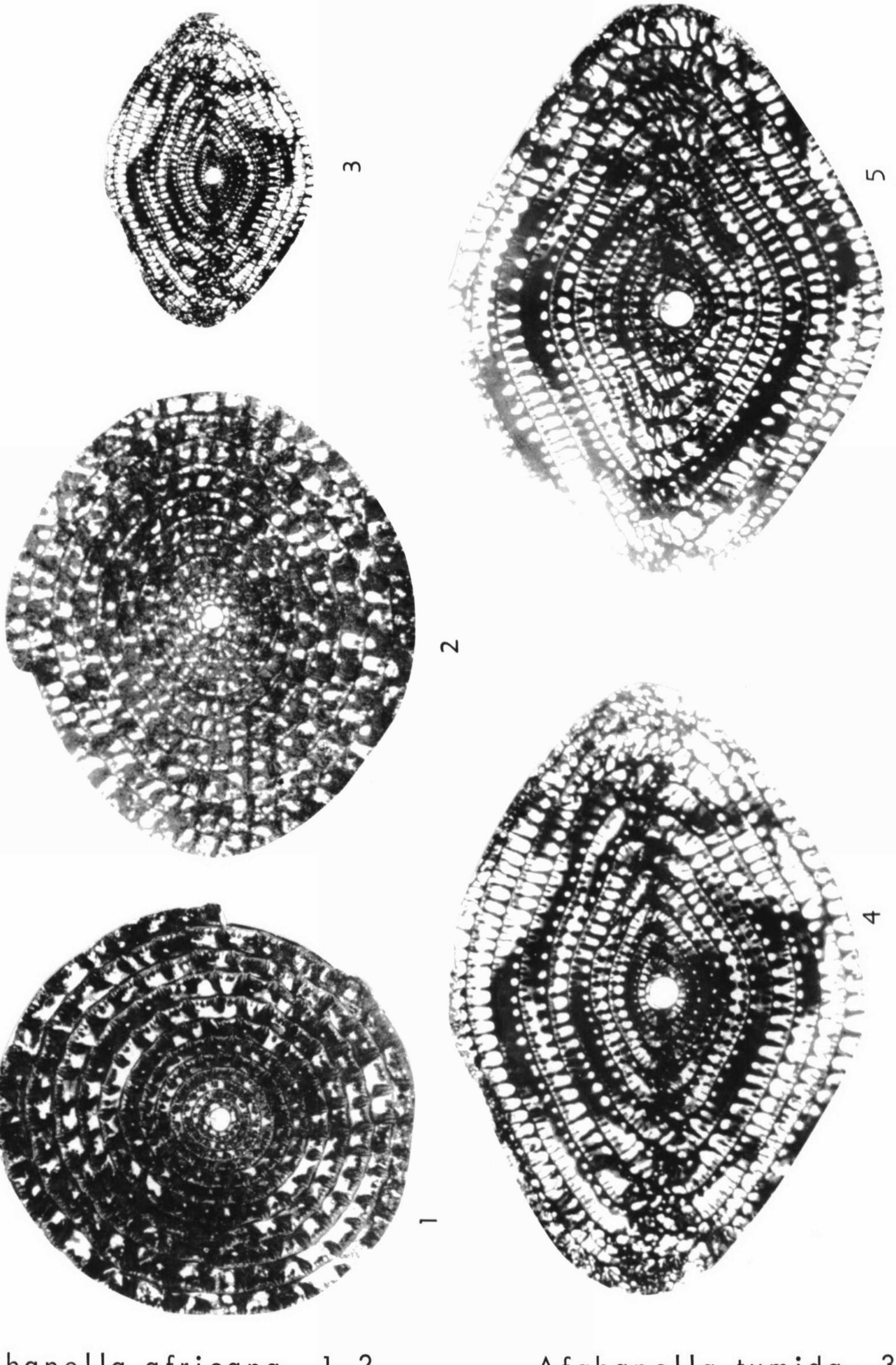
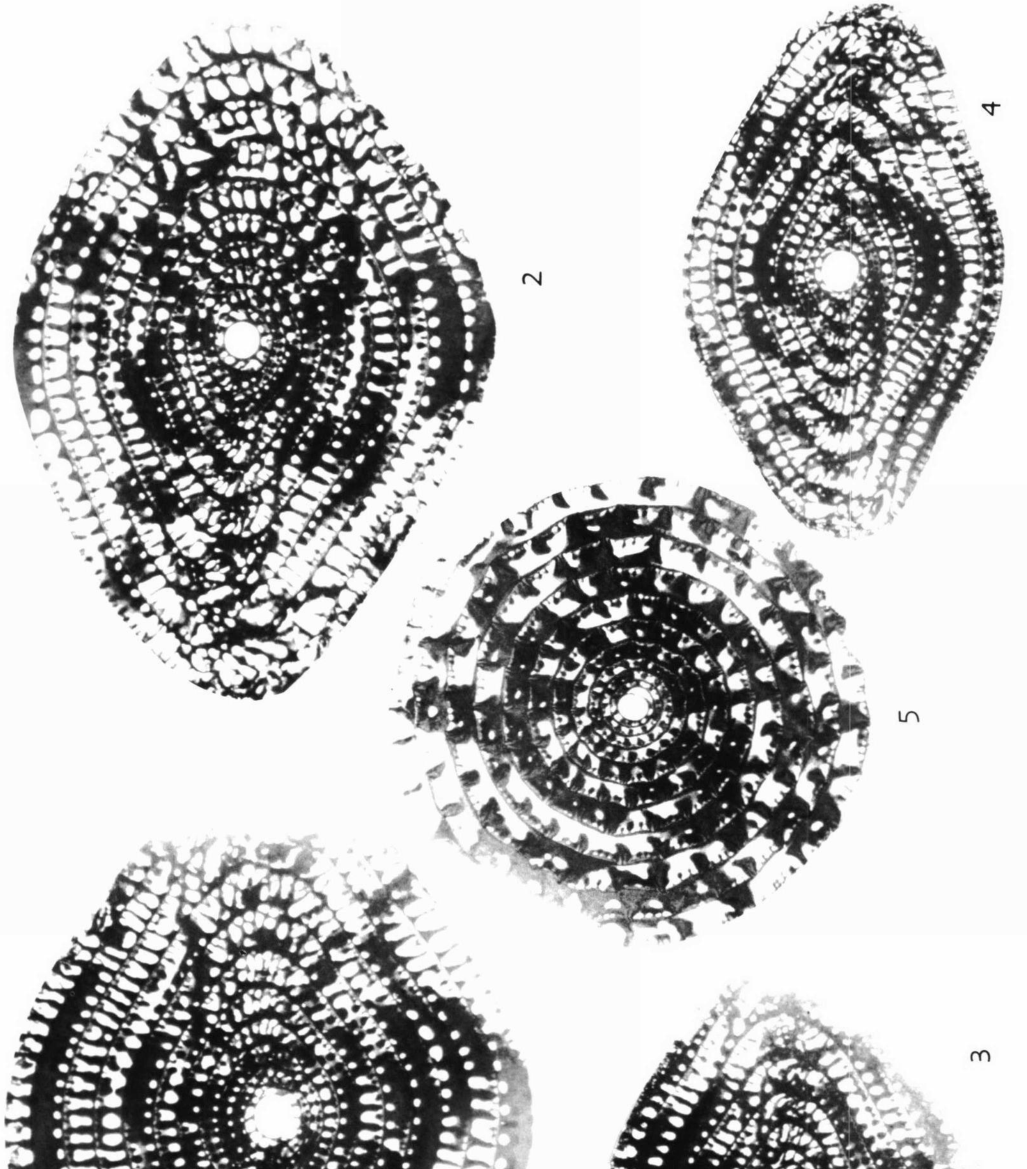
Afghanella robbinsae



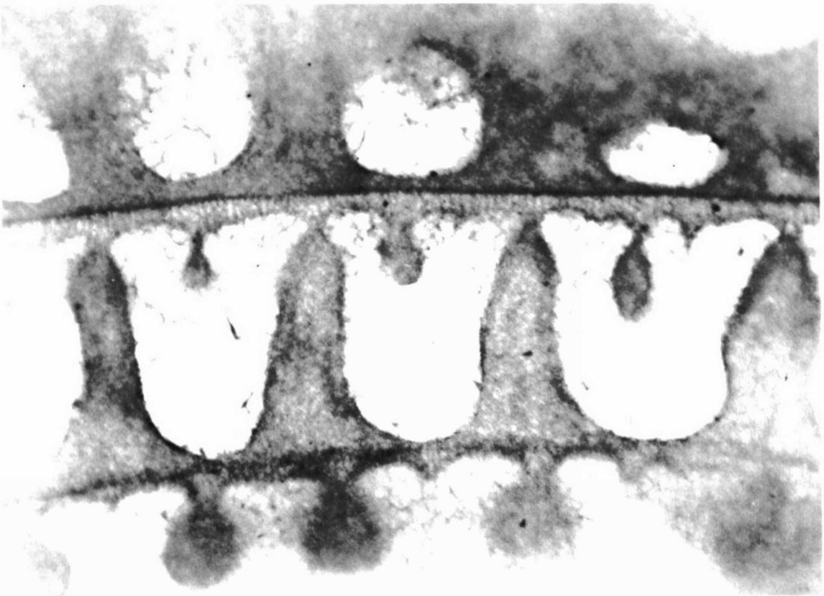
Afghanella africana



Afghanella africana, 1-2 *Afghanella tumida*, 3-5



Afghanella tumida



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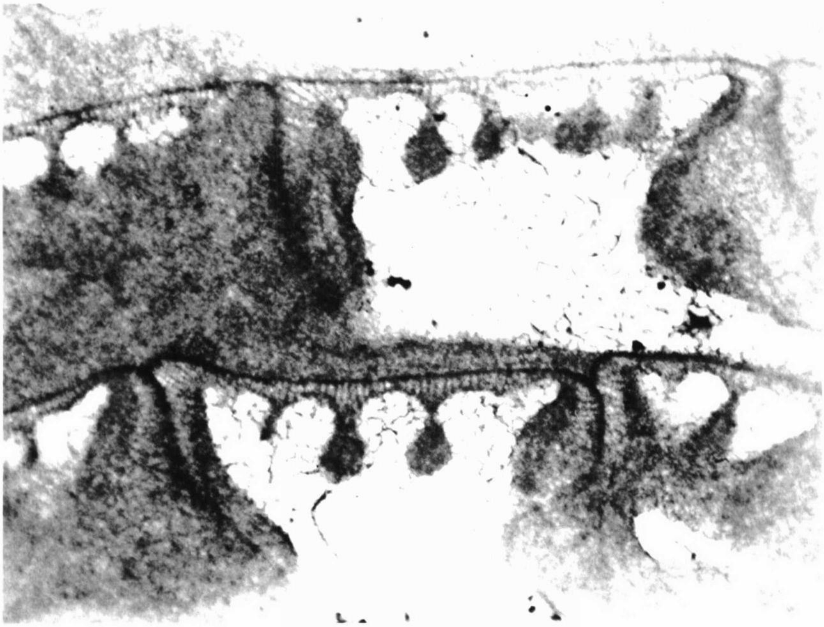

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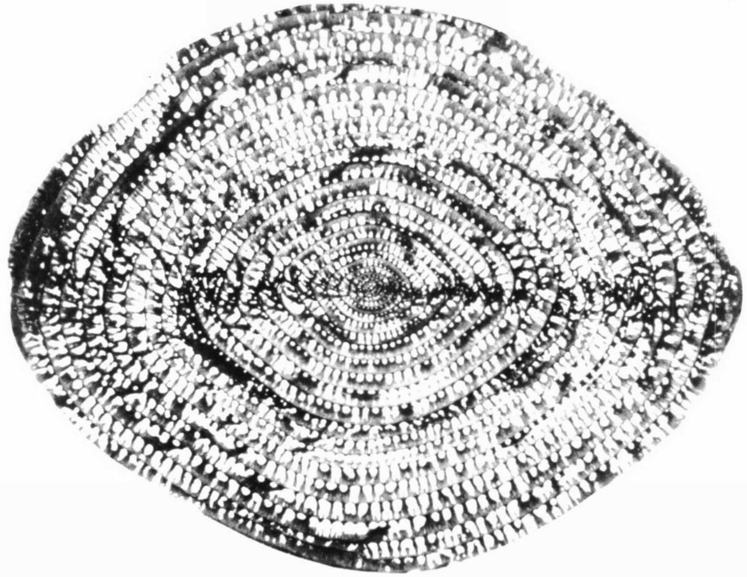
Afghanella tumida



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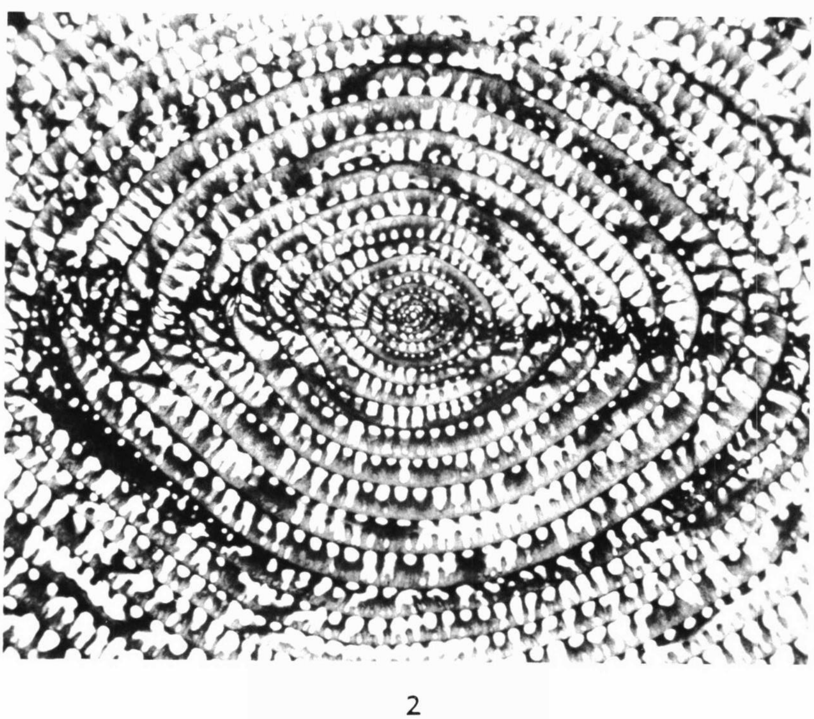

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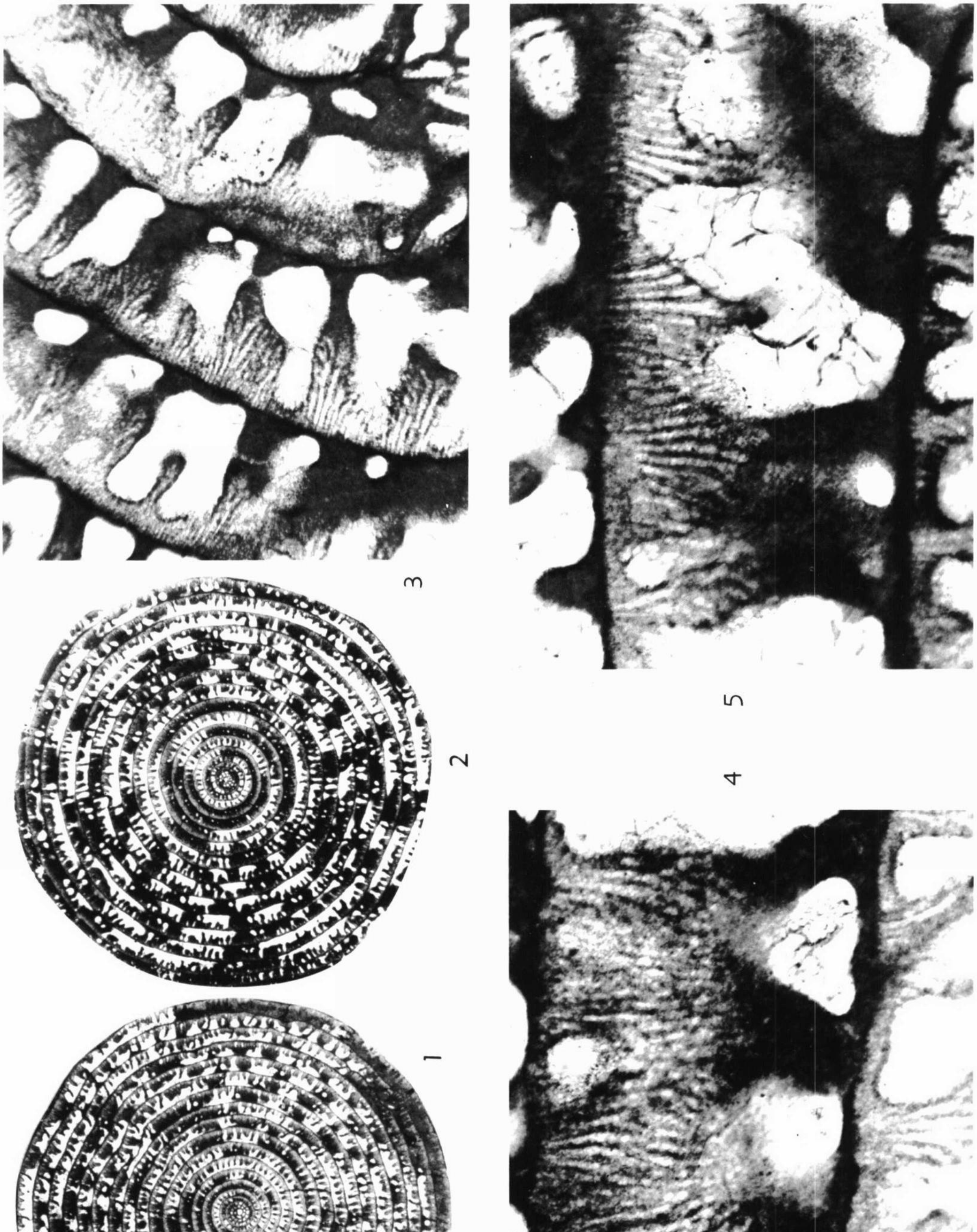
Yabeina syrtalis

Yabeina syrtalis



Yabeina syrtalis

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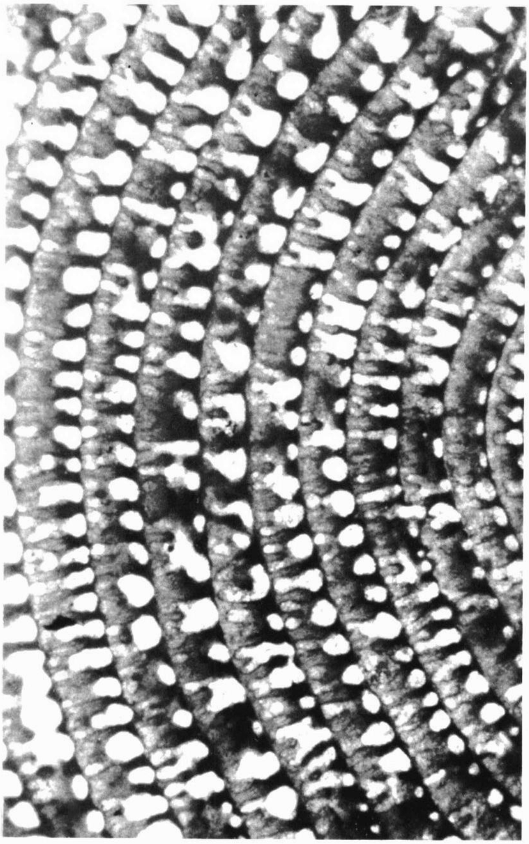

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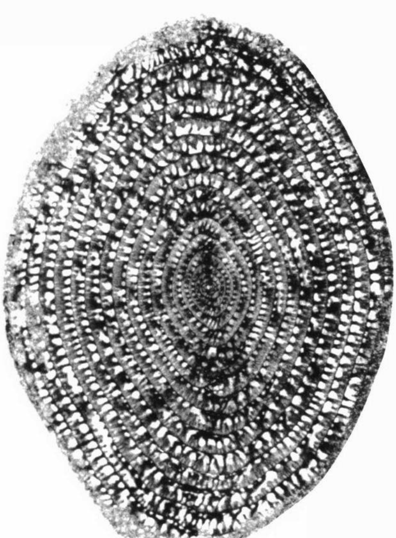

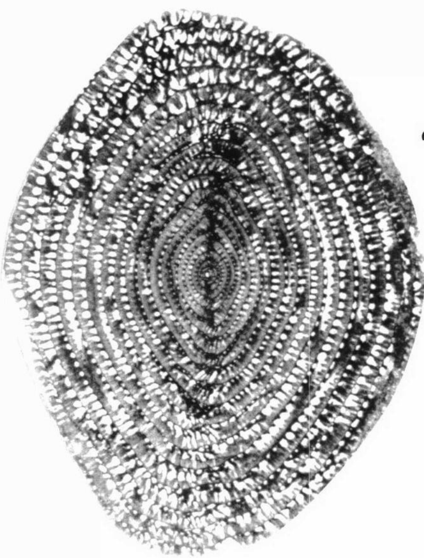

3

Yabeina punica

2

6

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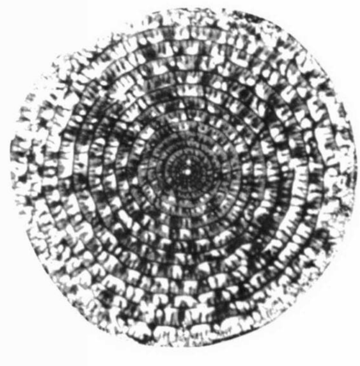
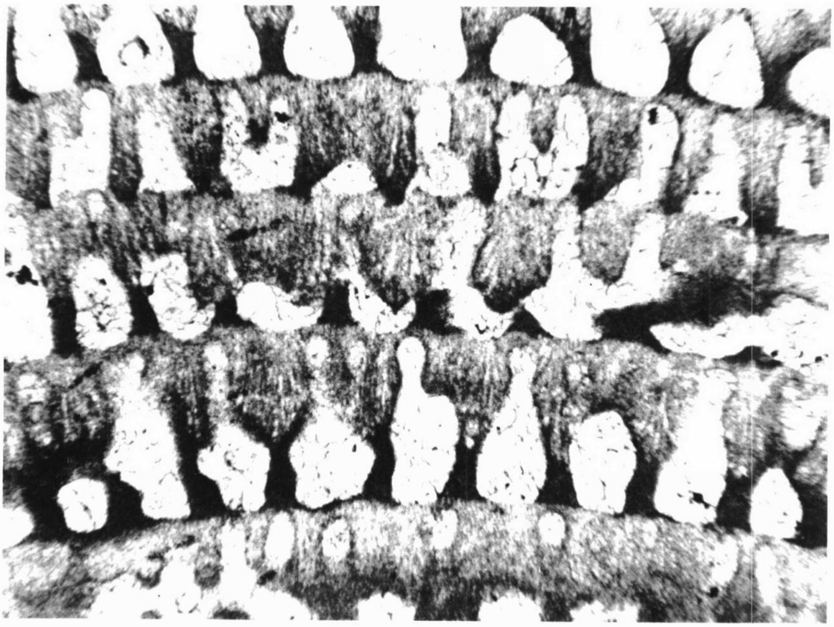


3

Yabeina punica



1

2

Yabeina punica

lection Tu-14.]——Plate 12, figures 1-2; 1, part of axial section, ×100; 2, part of sagittal section, ×100. [In both sections septal and mural pores appear dark because of being filled with iron oxide. Both from collection Tu-14.]——Plate 13, figures 1-2; 1, part of tangential section, ×300, showing character of septal pores; 2, part of tangential section showing end-on view of mural pores filled with iron oxide, ×300. [Both from collection Tu-14.]——Plate 14, figures 1-2; 1, part of sagittal section showing differentiation of layers of spirotheca (lighter layers, both inside and out, being secondary deposits related to chomata, present only in immediate vicinity of tunnel), ×300; 2, part of sagittal section showing penultimate septum and antetheca, ×300. [Both from collection Tu-14.] [All figures are unretouched photographs.]

Discussion.—Dunbarula mathieui is the largest member of the genus known at present, and it does not closely resemble any other described species. One of its outstanding characters is remarkable variation in shape and proportions. At first we were inclined to believe that at least two species were involved, but a study of more than 200 specimens reveals a complete gradational series from one extreme to the other.

Occurrence.—This species was originally described by Ciry from the upper part of the Tebaga section exposed on the south side of Djebel Saïkra, near the eastern end of the Permian exposure. In addition to topotypes, we have numerous specimens from several collections in the same stratigraphic zone on the south slope of the southern ridge of Djebel Tebaga, near the western end of the Permian exposure. French authors have referred to this upper sequence as the "*Bellerophon* beds" and have suggested a correlation with the Bellerophon Dolomite of the Alps. It is associated with *Chusenella rabatei* Skinner & Wilde, n. sp., and *Neoschwagerina fusiformis* Skinner & Wilde, n. sp., although these two species are comparatively rare. Ciry estimated that in his type material *D. mathieui* made up 60 to 70 percent of the rock, and it is equally abundant in our other collections which contain it. Although we have not seen it directly associated with *Yabeina*, it should be noted that this genus is abundant in our collection Tu-12, which apparently falls within the lower part of the biozone of *D. mathieui*. The main zone of *Yabeina* is stratigraphically lower. We have found this species in collections Tu-1, Tu-2, Tu-11, Tu-13, Tu-14, and Tu-15.

DUNBARULA NANA Kochansky-Devidé & Ramovš

Dunbarula nana Kochansky-Devidé & Ramovš, 1955, Slovenska Akad. Znanosti Umetnosti, Razred Prirodoslovne Vede, Classis 4 (Hist. Nat.), Razprave, p. 377-379, 409-410, pl. 1, fig. 3-5, 7; pl. 8, fig. 1.

Shell minute, ovoid, with convex lateral slopes and bluntly rounded poles; mature specimens with 4 to 5 volutions 0.60 to 1.16 mm. in length and 0.42 to 0.69 mm. in diameter; form ratio 1.28 to 1.79; 1st 2 to 3 whorls constitute a discoidal juvenarium which is coiled askew to outer volutions.

Spirotheca composed of tectum and diaphanotheca, in 4th whorl with thickness 17 to 19 μ, increasing to about 23 μ in 5th. Septa only moderately folded from pole to pole, but septal folds high; septal pores numerous but smaller and much less conspicuous than in *Dunbarula mathieui*; septa number 8 to 9 in 1st volution, 11 to 16 in 2nd, about 15 in 3rd, and 18 to 22 in 4th; secondary deposits present on both anterior and posterior faces of septa.

Proloculus minute, with outside diameter 30 to 62 μ. Tunnel very low, with marked widening between 4th and 5th volutions; tunnel angle 27 to 37 degrees in 4th whorl, and 41 to 51 degrees in 5th. Chomata low and narrow.

Illustrations.—Plate 15, figures 1-10; 1-3, axial sections, ×40; 4-6, slightly oblique axial sections, ×40; 7-10, sagittal sections, ×40. [All specimens from collection Tu-4. All figures are unretouched photographs.]

Discussion.—Dunbarula nana was originally described by Kochansky-Devidé & Ramovš from the *Neoschwagerina* zone of the Julian Alps in extreme northwestern Jugoslavia. Our specimens from Tunisia have a somewhat larger proloculus than those from Jugoslavia, our smallest measurement being equal to the largest given by Kochansky-Devidé & Ramovš. In all other respects, however, our specimens agree so closely with the types that we are convinced they are conspecific with the Jugoslavian species.

Occurrence.—We have found this species in collection Tu-4, from the lower part of the north slope of Baten Beni Zid, where it is associated with abundant algae. It is also present in collection Tu-6, where it is associated with *Neoschwagerina tebagaensis* Skinner & Wilde, n. sp., and

Kahlerina africana Skinner & Wilde, n. sp. Rare specimens are present in collections Tu-7 and Tu-8, where they occur with abundant *Yabeina punica* (Douvillé). All of these collections came from the north slope of Baten Beni Zid.

Subfamily SCHWAGERININAE Dunbar & Henbest, 1930

Genus CHUSENELLA Hsu, 1942

[emend. Chen, 1956]

CHUSENELLA RABATEI Skinner & Wilde, n. sp.

Shell of moderate size, elongate fusiform, with sharply extended pointed poles, fully grown individuals with 7 to 8 whorls, inner 2 or 3 of which are more tightly coiled than later ones, such specimens measuring 8.40 to 9.20 mm. in length and 2.50 to 2.80 mm. in diameter; form ratio 3.14 to 3.41.

Spirotheca composed of tectum and rather coarsely alveolar keriotheca, quite thin in early tightly coiled volutions, thickening abruptly between 3rd and 4th whorls, with thickness 16 to 23 μ in 1st whorl, 25 to 32 μ in 2nd, 32 to 40 μ in 3rd, 58 to 72 μ in 4th, 72 to 91 μ in 5th, 92 to 104 μ in 6th, and 105 to 125 μ in 7th. Septa nearly plane in inner whorls, being fluted only near poles, but in outer more loosely coiled volutions being strongly folded from pole to pole; septal folds high and narrow, commonly reaching to tops of chambers; septa number 7 to 10 in 1st volution, 11 to 13 in 2nd, 12 to 16 in 3rd, 13 to 17 in 4th, 16 to 21 in 4th, 16 to 21 in 5th, 18 to 23 in 6th, 22 to 23 in 7th, and about 26 in 8th; band of secondary material nearly fills shell along axis.

Proloculus rather small, with outside diameter 151 to 202 μ. Tunnel low and not very wide; tunnel angle 23 to 27 degrees in 4th whorl, 23 to 38 degrees in 5th, 30 to 40 degrees in 6th, and 35 to 42 degrees in 7th. Narrow chomata border tunnel in all except outermost 1 or 2 volutions.

Illustrations.—Plate 15, figures 11-19; 11, axial section of holotype, ×10; 12-14, axial sections of paratypes, ×10; 15-19, sagittal sections of paratypes, ×10. [11-13, 15, 17 from collection Tu-2; 14, 16, 18 from collection Tu-1; 19 from collection Tu-11. All figures are unretouched photographs.]

Discussion.—*Chusenella rabatei* Skinner & Wilde, n. sp., does not closely resemble any previously described species. It is named for Dr. J. Rabaté.

Occurrence.—This species is sparingly common in upper beds exposed on the southern slopes of Djebel Tebaga and Djebel Saïkra, where it is associated with abundant *Dunbarula mathieui* and rare specimens of *Neoschwagerina fusiformis* Skinner & Wilde, n. sp. We have found it in collections Tu-1, Tu-2, Tu-11, and Tu-15.

Family NEOSCHWAGERINIDAE Dunbar, 1948

Subfamily NEOSCHWAGERININAE Dunbar & Condra, 1927

Genus NEOSCHWAGERINA Yabe, 1903

NEOSCHWAGERINA GLINTZBOECKELI Skinner & Wilde, n. sp.

Shell of moderate size, inflated ellipsoidal, with strongly convex lateral slopes and bluntly rounded poles; mature specimens with 17.5 to 18.5 whorls, rarely 20 to 21, such specimens measuring 5.60 to 7.10 mm. in length and 4.80 to 5.90 mm. in diameter; form ratio 1.16 to 1.32.

Spirotheca composed of tectum and thin, finely alveolar keriotheca, with thickness of 26 to 29 μ in 14th whorl, 26 to 37 μ in 15th, 29 to 35 μ in 16th, and 29 to 37 μ in 17th. Septa essentially plane and rather widely spaced, their spacing increasing progressively with growth in such manner that increase in number from whorl to whorl is small; they number 4 to 7 in 1st volution, 9 to 15 in 2nd, 11 to 18 in 3rd, 13 to 16 in 4th, 14 to 17 in 5th, 14 to 16 in 6th, 14 to 18 in 7th, 14 to 18 in 8th, 13 to 19 in 9th, 15 to 21 in 10th, 15 to 20 in 11th, 15 to 22 in 12th, 17 to 21 in 13th, 18 to 22 in 14th, 21 to 23 in 15th, 22 to 28 in 16th, 25 to 27 in 17th, 25 to 26 in 18th, and about 28 in 19th; axial septula, consisting of ribbon-like prolongations of keriotheca make first appearance between septa in 3rd to 5th whorls, maximum number per chamber being 1 in 3rd to 5th volutions, 2 in 6th, 3 in 7th to 9th, 4 in 10th and 11th, and 5 from 12th outward. [These are maxima, and smaller numbers are frequently found in chambers of later whorls.]

Proloculus quite small, with outside diameter 75 to 154 μ, averaging about 100 μ. Row of rounded foramina along base of each septum from pole to pole, adjacent foramina separated by low, narrow parachomata which number zero to 2 in 1st whorl, 3 to 4 in 2nd, 5 to 8 in 3rd, 9 to 12 in 4th, 11 to 14 in 5th, 13 to 18 in 6th, 16 to 21 in 7th, 22 in 8th, 23 to 26 in 9th, 25 to 30 in 10th, 28 to 31 in 11th, 30 to 42 in 12th, 31 to 44 in 13th, 38 to 50 in 14th, 40 to 54 in 15th, 42 to 56 in 16th, 52 to 59 in 17th, 56 to 67 in 18th, and about 67 in the 19th; primary transverse septulum, formed in same manner as axial septula, positioned immediately above each parachoma, and basal margins of transverse septula joining tops of parachomata to form partitions which subdivide meridional chambers into rectangular chamberlets; small rounded to elliptical lateral foramina, usually located just in front of and just behind each septum, pierce these partitions to provide lateral communication within shell.

Illustrations.—Plate 16, figures 1-6; 1, axial section of holotype, ×10; 2-5, axial sections of paratypes, ×10; 6, sagittal section of paratype, ×10.——Plate 17, figures 1-5; 1-4, sagittal sections of paratypes, ×10; 5, part of specimen shown in figure 4, enlarged, ×100. [All specimens from collection Tu-5. All figures are unretouched photographs.]

Discussion.—Douvillé (1934) described and figured a single oblique parallel section from Djebel Tebaga as *Neoschwagerina* sp. cf. *N. craticulifera* (Schwager). The nature is such that it is impossible to determine its specific affinities. It could belong to the present species or to *N. tebagaensis* Skinner & Wilde, n. sp. *N. glintzboeckeli* Skinner & Wilde, n. sp., is superficially similar to *N. craticulifera occidentalis* Kochansky-Devidé & Ramovš, but differs in its larger size for the same number of whorls and its more numerous axial septula. This species is named for Dr. Charles Glintzboeckel.

Occurrence.—We have found this species only in collection Tu-5, from the north slope of Baten Beni Zid.

NEOSCHWAGERINA TEBAGAENSIS Skinner & Wilde, n. sp.

Shell small, inflated fusiform to subglobular, with strongly convex lateral slopes and bluntly rounded poles, mature individuals with 15 to 17 volutions, 4.20 to 5.00 mm. in length and 3.55 to 4.15 mm. in diameter; form ratio 1.14 to 1.26.

Spirotheca composed of tectum and finely alveolar keriotheca, with thickness of 29 to 35 μ in 12th whorl, 27 to 36 μ in 13th, 27 to 32 microns in 14th, 26 to 27 μ in 15th, and 33 to 36 μ in 16th. Septa plane and widely spaced, septal count increasing very slowly from whorl to whorl; they number 5 to 6 in 1st volution, 9 to 10 in 2nd, 11 to 12 in 3rd, 12 to 13 in 4th, 13 to 14 in 5th, 13 to 17 in 6th, 16 to 19 in 7th, 15 to 18 in 8th, 14 to 19 in 9th, 15 to 20 in 10th, 16 to 18 in 11th, 15 to 18 in 12th, 15 to 20 in 13th, and 15 to 21 in 14th; axial septula, consisting of ribbon-like prolongations of keriotheca, first appear in 3rd whorl with maximum of 1 per chamber in 3rd to 5th whorls, 2 in 6th to 8th, 3 in 9th, 4 in 10th and 11, and 5 from 12th volution outward.

Proloculus minute, with outside diameter 62 to 105 μ, averaging about 81 μ; row of elliptical foramina present along basal margin of each septum from pole to pole, these foramina alternating with low, narrow parachomata which number zero to 1 in 1st whorl, 2 to 3 in 2nd, 3 to 5 in 3rd, 4 to 8 in 4th, 7 to 11 in 5th, 9 to 14 in 6th, 12 to 16 in 7th, 13 to 21 in 8th, 17 to 25 in 9th, 20 to 26 in 10th, 22 to 31 in 11th, 24 to 36 in 12th, 28 to 38 in 13th, 30 to 44 in 14th, 35 to 45 in 15th, and 40 to 43 in 16th; primary transverse septulum located immediately above each parachoma, and basal margins of septula joining tops of parachomata to form partitions which divide meridional chambers into rectangular chamberlets, lateral foramina piercing these partitions, usually just in front of and behind each septum so as to provide lateral communication within shell. [A few incipient secondary transverse septula have been observed in the outer whorls of some specimens, but these are sporadic in their occurrence and inconspicuous.]

Illustrations.—Plate 18, figures 1-9; 1, axial section of holotype, ×10; 2-4, axial sections of paratypes, ×10; 5-7, sagittal sections of paratypes, ×10; 8, axial section of holotype, ×20; 9, specimen shown in figure 5, enlarged, ×20. [All from collection Tu-6. All figures are unretouched photographs.]

Discussion. — *Neoschwagerina tebagaensis* Skinner & Wilde, n. sp., resembles *Neoschwagerina craticulifera occidentalis* Kochansky-Devidé & Ramovš. It differs from the latter in its slightly larger proloculus, earlier appearance and greater number of its axial septula, and presence of incipient secondary transverse septula in the outer whorls. It differs from *N. glintzboeckeli* Skinner & Wilde, n. sp., in its smaller size, less numerous whorls, generally smaller proloculus, and the presence of incipient secondary transverse septula.

Occurrence.—We have found this species only in collection Tu-6 from the north slope of Baten Beni Zid, where it is associated with *Dunbarula nana* KOCHANSKY-DEVIDÉ & RAMOVŠ and *Kahlerina africana* SKINNER & WILDE, n. sp.

NEOSCHWAGERINA FUSIFORMIS Skinner & Wilde, n. sp.

Shell of moderate size, inflated fusiform, with straight to slightly convex lateral slopes and bluntly pointed poles; fully grown individuals with about 20 volutions about 8.60 mm. in length and 5.70 mm. in diameter; form ratio 1.51 to 1.75.

Spirotheca composed of tectum and finely alveolar keriotheca, with thickness of 26 to 35 μ in 12th whorl, 32 to 36 μ in 13th, 30 to 36 μ in 14th, 33 to 40 μ in 15th, 32 to 40 μ in 16th, about 35 μ in 17th, 36 μ in 18th, and 48 μ in 19th. Septa essentially plane, rather widely spaced, increasing in number very gradually from whorl to whorl; they number 6 to 7 in 1st volution, about 10 in 2nd, 11 to 13 in 3rd, 14 to 17 in 4th, 13 to 16 in 5th, 13 to 16 in 6th, 13 to 15 in 7th, 13 to 15 in 8th, 15 to 16 in 9th, 16 in 10th, 16 in 11th, 18 in 12th, and 17 in 13th; axial septula, composed of ribbon-like extensions of keriotheca, first appear in 4th volution with maximum of 1 per chamber in 4th and 5th whorls, 2 in 6th to 9th, 3 in 10th and 11th, and 4 from 12th outward.

Proloculus minute, with outside diameter 62 to 125 μ; row of low elliptical foramina located along basal margin of each septum from pole to pole, foramina alternating with low, narrow parachomata which number 1 in 1st whorl, 2 to 3 in 2nd, 3 to 5 in 3rd, 6 to 9 in 4th, 8 to 12 in 5th, 11 to 16 in 6th, 16 to 21 in 7th, 19 to 25 in 8th, 21 to 28 in 9th, 25 to 31 in 10th, 29 to 35 in 11th, 32 to 40 in 12th, 37 to 43 in 13th, 42 in 14th, 45 in 15th, 49 in 16th, 56 in 17th, 56 in 18th, and 62 in 19th; primary transverse septulum positioned directly above each parachoma, basal margins of septula joining tops of parachomata to form partitions which subdivide chambers into rectangular chamberlets; elliptical lateral foramina, commonly located just in front of and just behind each septum, provide lateral communication within shell through these partitions.

Illustrations.—Plate 19, figures 1-8; 1, axial section of holotype, an unusually large specimen, ×10; 2-4, axial sections of paratypes, ×10; 5-6, sagittal sections of immature paratypes, ×10; 7, part of holotype, ×20; 8, specimen shown in figure 5, enlarged, ×20. [All from collection Tu-15. All figures are unretouched photographs.]

Discussion.—*Neoschwagerina fusiformis* SKINNER & WILDE, n. sp., is similar in shape to *N. craticulifera* (SCHWAGER), but differs from that species in being markedly larger for a given number of whorls and in having a greater number of axial septula.

Occurrence.—This is a comparatively rare species, and we have only a few specimens. We have found it only in collection Tu-15, from the upper part of the Tebaga sequence on the south slope of the southern ridge of Djebel Tebaga. It is associated with abundant specimens of *Dunbarula mathieui* CIRY, and rare individuals of *Chusenella rabatei* SKINNER & WILDE, n. sp. It is particularly interesting because it is the stratigraphically highest known neoschwagerinid in the Tebaga section, occurring well above the highest known specimens of *Yabeina*. Furthermore, it is less advanced, from an evolutionary viewpoint, than *N. tebagaensis* which occurs far lower in the section. We have seen similar anachronisms among the neoschwagerinids in other places; for example, *N. minoensis* DEPRAT, a relatively simple species, occurs with *Y. globosa* (YABE) at Akasaka, Japan. GUBLER (1935) was so impressed with the apparent lack of correlation between stratigraphic position and evolutionary development of the neoschwagerinids in Cambodia that he concluded they are worthless for stratigraphic work. We should hardly go so far as GUBLER in this respect, but we believe that any zonation based on neoschwagerinids should be founded on species and not merely on genera. Moreover, the comparative development of a given species can often be misleading as to its stratigraphic position within the range of the genus. *N. minoensis*, cited above, occurs near the upper limit of *Neoschwagerina*, but its evolutionary development is of a sort that would normally be expected low in the range of the genus.

Genus AFGHANELLA Thompson, 1946

AFGHANELLA ROBBINSAE Skinner & Wilde, n. sp.

Shell small, fusiform, with straight to slightly convex lateral slopes and bluntly pointed poles, mature specimens with 8 to 9.5 volutions, 4.59 to 5.61 mm. in length and 2.38 to 3.07 mm. in diameter; form ratio 1.63 to 2.36, averaging about 1.86.

Spirotheca composed of tectum and very thin, finely alveolar keriotheca, with thickness of 10 to 16 μ in 6th whorl, 12 to 14 μ in 7th, and 12 to 14 μ in 8th. Septa essentially plane and covered with thick deposit of secondary material, as result being thinnest at top and thickening rapidly downward so that in sagittal sections they present club-shaped appearance; they number 7 to 9 in 1st whorl, 12 to 14 in 2nd, 13 to 17 in 3rd, 14 to 18 in 4th, 17 to 21 in 5th, 16 to 22 in 6th, 21 to 26 in 7th, 23 to 26 in 8th, and 25 to 26 in 9th; short axial septula, composed of ribbon-like prolongations of keriotheca and greatly thickened by secondary deposits, appear in 1st volution and like septa, present club-shaped outline as seen in sagittal sections; maximum of 1 septulum per chamber in 1st and 2nd whorls, 2 in 3rd, 3 in 4th and 5th, 4 in 6th and 7th, and 5 in 8th and 9th.

Proloculus moderately large, with outside diameter 198 to 302 μ, averaging about 248 μ; row of small, elliptical foramina located along basal margin of each septum from one end of shell to other, adjacent foramina being separated by moderately high, rather thick parachomata which number 4 to 6 in 1st whorl, 8 to 10 in 2nd, 11 to 14 in 3rd, 16 to 18 in 4th, 18 to 21 in 5th, 22 to 28 in 6th, 30 to 34 in 7th, 34 to 38 in 8th, and 40 to 41 in 9th; primary transverse septulum positioned immediately above each parachoma, basal margins of septula being joined to tops of parachomata so as to produce partitions which subdivide meridional chambers into rectangular chamberlets, lateral communication within shell provided by elliptical lateral foramina which commonly pierce these partitions just in front of and just behind each septum; secondary transverse septula, similar to primary ones but shorter, intercalated between pairs of primary septula, appearing in 1st whorl, in 1st 3 volutions with never more than 1 between each pair of primary septula, in 4th and 5th whorls usually with 1, rarely 2, and from 6th whorl outward with 1 or 2, rarely 3; transverse septula, both primary and secondary, formed in same manner as axial septula, and like them greatly thickened toward their lower margins so that in axial sections they present a club-shaped outline (Pl. 21, fig. 4). [In many respects the members of this genus resemble species of *Sumatrina*, and they have sometimes been confused with that genus in the past. The principal differences are that *Sumatrina* is more elongate in shape, and the spirotheca is so thin that the keriotheca can be distinguished only in exceptionally well-preserved specimens. In fact, for many years *Sumatrina* was thought to have a spirotheca composed only of the tectum. *Afghanella* is almost certainly the direct ancestor of *Sumatrina*.]

Illustrations.—Plate 20, figures 1-6; 1-2, axial section of holotype, ×10, ×20; 3-5, axial sections of paratypes, ×20; 6, sagittal section of paratype, ×20.——Plate 21, figures 1-4; 1, axial section of paratype, ×20; 2-3, sagittal sections of paratypes, ×20; 4, part of specimen shown in Plate 20, figure 4, enlarged, ×200, to show structure of spirotheca. [All specimens from collection Tu-20. All figures are unretouched photographs.]

Discussion.—*Afghanella robbinsae* SKINNER & WILDE, n. sp., is similar to *A. schencki* THOMPSON, the type species of the genus, from the Bamian Limestone of Afghanistan. The latter, however, has a more ellipsoidal shape and a generally smaller proloculus. Also, *A. robbinsae* is somewhat larger than *A. schencki*. This species is named for Mrs. SARA L. ROBBINS, who prepared most of the thin-sections on which this study is based.

Occurrence.—We have found this species only in collection Tu-20, from a depth of 2,137 to 2,138.6 meters in the Bir Soltane well. It is associated with rare specimens of a very small undescribed species of *Dunbarula*.

AFGHANELLA AFRICANA Skinner & Wilde, n. sp.

Shell small, thickly ellipsoidal, with convex lateral slopes and bluntly rounded poles, fully grown individuals with 10.5 to 12 whorls 3.91 to 4.67 mm. in length and 2.66 and 2.89 mm. in diameter; form ratio 1.44 to 1.68.

Spirotheca composed of tectum and very thin, finely alveolar keriotheca, with thickness of 10 to 13 μ in 6th volution, 10 to 12 μ in 7th, 10 to 13 μ in 8th, 10 to 14 μ in 9th, and 12 to 14 μ in 10th. Septa essentially plane, numbering 7 to 8 in 1st whorl, 13 to 14 in 2nd, 15 in 3rd, 15 to 18 in 4th, 17 to 20 in 5th, 19 to 21 in 6th, 20 to 26 in 7th, 22 to 25 in 8th, 24 to 26 in 9th, 29 in 10th, 31 in 11th, and 34 in 12th; septa thickened downward by coating of secondary material on both their anterior and posterior faces so that they appear club-shaped in sagittal sections, thicker at their tips than at their tops; short axial septula, also club-shaped in section, present in all volutions with maximum of 1 per chamber in 1st 4 whorls, 2 in 5th, 3 in 6th to 8th, and 4 in 9th to 12th.

Proloculus rather small, with outside diameter 147 to 216 μ, averaging about 183 μ; row of small, elliptical foramina present along base of each septum from pole to pole, adjacent foramina being separated by rather high, thick parachomata that number 3 to 4 in 1st whorl, 6 to 8 in 2nd, 9 to 12 in 3rd, 11 to 16 in 4th, 14 to 21 in 5th, 19 to 22 in 6th, 21 to 25 in 7th, 29 to 31 in 8th, about 31 in 9th, and 33 in 10th; primary transverse septulum positioned immediately above each parachoma with bases of septula joined to tops of parachomata to form partitions which subdivide meridional chambers into rectangular chamberlets; just in front of and behind each septum these partitions pierced by elliptical lateral foramina which provide lateral communication within shell; transverse septula, like axial ones, composed of ribbon-like extensions of alveoli of keriotheca but alveoli visible only in uppermost part, lower portion being obscured by secondary material which penetrates alveoli and makes that part of septulum appear as solid mass; thickening of septula by secondary deposits gives them club-shaped outline as seen in axial sections; short secondary transverse septula intercalated between pairs of primary septula first appear in 2nd volution and from there to 6th whorl commonly show 1 between each pair of primary septula, rarely 2, but from 7th whorl outward either 1 or 2 are about equally common; secondary septula similar in appearance and mode of formation, principal difference being their lesser length.

Illustrations.—Plate 22, figures 1-6; 1-2, axial section of holotype, $\times 10$, $\times 20$; 3-5, axial section of paratypes, $\times 20$; 6, sagittal section of paratype, $\times 20$.——Plate 23, figures 1-2; 1-2, sagittal sections of paratypes, $\times 20$. [All specimens from collection Tu-22. All figures are unretouched photographs.]

Discussion.—*Afghanella africana* Skinner & Wilde, n. sp., differs from *A. robbinsae* Skinner & Wilde, n. sp., in its smaller size, more numerous volutions, smaller form ratio, and smaller proloculus. It may be distinguished from *A. schencki* Thompson by its larger size, more inflated shape, and smaller form ratio.

Occurrence.—We have found this species only in collection Tu-22, from a depth of 2,242.6 meters in the Bir Soltane well. It is associated with rare specimens of *Neoschwagerina* sp., *Ozawainella* sp., and *Staffella* sp.

AFGHANELLA TUMIDA Skinner & Wilde, n. sp.

Shell small, highly inflated fusiform, with nearly straight lateral slopes and bluntly rounded poles, mature individuals with 10.5 to 11.5 whorls 4.39 to 5.15 mm. in length and 3.17 to 3.66 mm. in diameter; form ratio 1.37 to 1.51, averaging about 1.43.

Spirotheca composed of tectum and very thin, finely aveolar keriotheca (Pl. 25, figs. 1, 2), with thickness of 12 to 14 μ in 6th to 10th volutions. Septa essentially plane, composed of tectum accompanied by keriotheca at least in the upper part, latter is present on both anterior and posterior faces of septa (Pl. 25, fig. 2); lower margins of septa greatly thickened by secondary deposit. In the single sagittal section which permits a septal count, from the 1st to 10th volution, this is 8-11-15-17-18-20-21-23-24-31. In this specimen the maximum number of axial septula per chamber is 1 in 1st 3 whorls, 2 in 4th, 3 in 5th and 6th, and 4 in 7th to 11th; from 9th whorl outward there are rarely as many as 5 per chamber, but commonly only 3 or 4; these septula are short, very narrow at their points of departure from the spirotheca, and widen downward because of secondary thickening (Pl. 25, fig. 2). The constituent elongated alveoli are distinguishable only in the upper parts of the septula.

Proloculus somewhat larger than common in species of this genus, with outside diameter 202 to 304 μ, averaging about 258 μ; row of elliptical foramina located along basal margin of each septum from one end of shell to other, adjacent foramina being separated by thick, moderately high parachomata which number 4 to 5 in 1st whorl, 8 to 9 in 2nd, 11 to 13 in 3rd, 13 to 16 in 4th, 17 to 21 in 5th, 20 to 25 in 6th, 25 to 29 in 7th, 29 to 34 in 8th, 32 to 37 in 9th, 36 to 42 in 10th, and about 44 in 11th; primary transverse septulum positioned immediately above each parachoma with basal margins of septula joined to tops of parachomata to form partitions which subdivide meridional chambers into rectangular chamberlets, lateral communication within shell provided by elliptical lateral foramina which penetrate these partitions just in front of and just behind each septum; short secondary transverse septula intercalated between pairs of primary septula, from 1st volution to 3rd with only 1 secondary septulum between each pair of primary septula, in 4th to 6th whorls commonly 1 or rarely 2, in 7th and 8th volutions 1 or 2 about equally common, and from 9th whorl outward as many as 3, but this is rare; both primary and secondary transverse septula formed in same manner as axial septula, and with similar thickened, club-shaped outline (Pl. 25, fig. 1).

Illustrations.—Plate 23, figures 3-5; 3-4, axial section of holotype, ×10, ×20; 5, axial section of paratype, ×20.——Plate 24, figures 1-5; 1-4, axial sections of paratypes, ×20; 5, sagittal section of paratype, ×20.——Plate 25, figures 1-2; 1, part of the axial section shown in plate 24, figure 2, enlarged, ×200, to show the spirothecal structure; 2, part of the sagittal section shown in plate 24, figure 5, enlarged, ×200. [All specimens from collection Tu-25. All figures are unretouched photographs.]

Discussion.—*Afghanella tumida* Skinner & Wilde, n. sp., more nearly resembles *A. sumatrinaeformis* (Gubler) than any other previously described species. It differs from the latter in its more fusiform shape, generally larger proloculus, and greater number of axial septula.

Occurrence.—We have found this species only in collection Tu-25, from a depth of 2,642 meters in the Bir Soltane well. It is associated with rare badly crushed specimens of *Verbeekina* sp.

Genus YABEINA Deprat, 1914

YABEINA SYRTALIS *(Douvillé)*

Neoschwagerina syrtalis Douvillé, 1934, Mém. Service Carte Géol. Tunisie, n. ser., no. 1, p. 83, 84, pl. 3, fig. 4-9.

Yabeina syrtalis Ciry, 1954, Bull. Soc. Sci. Nat. de Tunisie, v. 7, p. 111-122, pl. 20, fig. 1-6.

Shell large, highly inflated fusiform, with convex lateral slopes and bluntly rounded poles; mature specimens commonly have 21 to 23 volutions, although few individuals may have as many as 24 or 25, such specimens measuring 9.80 to 10.00 mm. in length and 6.80 to 7.75 mm. in diameter; form ratio 1.26 to 1.44; 1st 2 or 3 whorls commonly discoidal and coiled askew to later volutions.

Spirotheca composed of tectum and thin, finely alveolar keriotheca, with thickness of 20 to 25 μ in 18th whorl, 20 to 26 μ in 19th, 19 to 26 μ in 20th, 22 to 29 μ in 21st, 23 to 26 μ in 22nd, and about 22 μ in 23rd. Septa essentially plane and widely spaced, numbering 4 to 7 in 1st volution, 8 to 13 in 2nd, 11 to 18 in 3rd, 12 to 16 in 4th, 12 to 17 in 5th, 15 to 18 in 6th, 15 to 17 in 7th, 15 in 8th, 15 to 19 in 9th, 17 to 22 in 10th, 22 to 27 in 11th, 21 to 22 in 12th, 20 to 22 in 13th, 18 to 23 in 14th, 21 to 25 in 15th, 19 to 32 in 16th, 19 to 26 in 17th, 23 to 27 in 18th, about 25 in 19th, and 28 in 20th; axial septula, composed of ribbon-like prolongations of keriotheca, 1st appearing in 4th volution, their tips commonly consolidated by plugging of ends of constituent alveoli with secondary material; with maximum of 1 per chamber in 4th whorl, 2 in 5th, 3 in 6th and 7th, 4 in 8th and 9th, 5 in 10th and 11th, 6 in 12th, 7 in 13th, 8 in 14th to 16th, 9 in 17th and 18th, and 10 in 19th and 20th. [These are maxima, and many chambers in the outer whorls may have fewer than the numbers indicated.]

Proloculus quite small, with outside diameter 50 to 108 μ, averaging about 68 μ; row of elliptical foramina present along basal margin of each septum from pole to pole, these foramina alternating with low, narrow parachomata which 1st appear in 2nd volution, parachomata numbering 3 to 4 in second whorl, 4 to 5 in 3rd, 5 to 7 in 4th, 8 to 11 in 5th, 11 to 16 in 6th, 14 to 20 in 7th, 15 to 22 in 8th, 18 to 25 in 9th, 20 to 34 in 10th, 25 to 38 in 11th, 31 to 45 in 12th, 32 to 45 in 13th, 34 to 49 in 14th, 42 to 55 in 15th, 45 to 59 in 16th, 48 to 61 in 17th, 53 to 72 in 18th, 56 to 73 in 19th, 61 to 74 in 20th, 64 to 70 in 21st, 71 to 79 in 22nd, 71 to 85 in 23rd, about 77 in 24th, and 80 in 25th; primary transverse septulum positioned directly above each parachoma with bases of septula joined to tops of parachomata to form partitions which divide meridional chambers into rectangular chamberlets, elliptical lateral foramina penetrating these partitions just fore and aft of each septum to provide lateral communication within shell; short secondary transverse septula 1st appear between pairs of primary septula in 6th whorl, until 12th whorl is reached never more than 1 secondary septulum between adjacent primary septula, from 12th whorl outward commonly 1 and rarely 2; both the primary and secondary septula, like axial septula, composed of prolongations of some alveoli of keriotheca (Pl. 28, figs. 3-5), and tips of some of them have been consolidated by plugging of lower ends of alveoli with secondary material.

Illustrations.—Plate 26, figures 1-2; 1-2, axial section of topotype, ×10, ×20.——Plate 27, figures 1-4; 1-3, axial sections of topotypes, ×10; 4, sagittal section of topotype, ×10.——Plate 28, figures 1-5; 1-2, sagittal sections of topotypes, ×10; 3, part of specimen shown in Plate 26, figure 1, enlarged, ×100, showing structure of spirotheca and septula; 4-5, parts of same specimen, ×200. [All from collection Tu-3. All figures are unretouched photographs.]

Discussion.—Douvillé (1934) described this species as *Neoschwagerina syrtalis*. Ciry (1954) redescribed it, pointing out that it actually belongs in the genus *Yabeina*. It more nearly resembles *Y. globosa* (Yabe) than any other described species, but may be distinguished from the latter by its less well developed and less numerous secondary transverse septula, and by its larger proloculus.

Occurrence.—We have found this species in collections Tu-3 and Tu-9, from the interval exposed between Baten Beni Zid and the southern ridge of Djebel Tebaga. It also occurs, but rarely, in collection Tu-8, from the upper part of the north slope of Baten Beni Zid, where it is associated with abundant specimens of *Yabeina punica* (Douvillé).

YABEINA PUNICA *(Douvillé)*

Neoschwagerina globosa Yabe, race *punica* Douvillé, 1934, Mém. Service Carte Géol. Tunisie, n. ser., no. 1, p. 81, 82, pl. 2, fig. 5-11; pl. 3, fig. 1-3.

Neoschwagerina globosa Yabe, race *suboequalis* Douvillé, 1934, ibid., p. 79-81, pl. 2, fig. 2-4.

Shell moderately large, highly inflated fusiform to subglobular, with convex lateral slopes and bluntly rounded poles; mature individuals with 18 to 20 whorls, exceptionally 21, such specimens measuring 6.70 to 9.40 mm. in length and 4.80 to 6.40 mm. in diameter, average length and diameter of 14 typical specimens being 7.83 mm. and 5.59 mm., respectively; form ratio 1.28 to 1.56, averaging about 1.39.

Spirotheca composed of tectum and thin, finely alveolar keriotheca (Pl. 32, figs. 1, 2) with thickness of 17 to 26 μ in 17th whorl, 17 to 23 μ in 18th, 17 to 23 μ in 19th, and 19 to 23 μ 20th. Septa essentially plane and rather widely spaced, numbering 6 to 7 in 1st whorl, 10 to 13 in 2nd, 12 to 15 in 3rd, 14 to 16 in 4th, 13 to 16 in 5th, 13 to 23 in 6th, 14 to 22 in 7th, 12 to 19 in 8th, 13 to 19 in 9th, 15 to 17 in 10th, 13 to 20 in 11th, 16 to 19 in 12th, 17 to 20 in 13th, 18 to 21 in 14th, 17 to 22 in 15th, 18 to 20 in 16th, and 18 to 20 in 17th; axial septula, composed of ribbon-like extensions of part of keriotheca, 1st appearing in 2nd volution, their tips commonly consolidated by plugging of ends of constituent alveoli with secondary material, with maximum of 1 per chamber in 2nd to 4th whorls, 2 in 5th and 6th, 3 in 7th, 4 in 8th, 5 in 9th, 6 in 10th, 7 in 11th, 8 or 9 in 12th, 10 in 13th and 14th, 11 in 15th and 16th, and 12 from 17th outward. [These are maximum figures, and smaller numbers are commonly found in some chambers of the outer whorls.]

Proloculus small, with outside diameter 62 to 137 μ, averaging about 90 μ; row of small, elliptical foramina present along basal margin of each septum from pole to pole, these foramina alternating with low, rather narrow parachomata (Pl. 29, fig. 2) which number zero to 1 in 1st volution, 1 to 5 in 2nd, 3 to 6 in 3rd, 7 to 9 in 4th, 8 to 13 in 5th, 10 to 18 in 6th, 12 to 22 in 7th, 14 to 27 in 8th, 19 to 37 in 9th, 25 to 37 in 10th, 30 to 43 in 11th, 32 to 44 in 12th, 34 to 46 in 13th, 40 to 53 in 14th, 44 to 58 in 15th, 45 to 65 in 16th, 48 to 67 in 17th, 57 to 70 in 18th, 63 to 77 in 19th, 66 to 73 in 20th, and about 75 in 21st; primary transverse septulum located immediately above each parachoma, with basal margins of septula joined to tops of parachomata to form partitions which divide meridional chambers into rectangular chamberlets, lateral foramina piercing these partitions just fore and aft of each septum to provide lateral communication within shell; short secondary transverse septula, intercalated between pairs of primary septula, 1st appearing in 4th volution, from 4th through 9th whorls never more than 1 between adjacent primary septula, from 10th through 13th commonly 1 per pair, and rarely 2, from 14th whorl outward 1 or 2 about equally common; both primary and secondary transverse septula, like axial septula, composed of elongated alveoli of keriotheca (Pl. 32, fig. 1).

Illustrations.—Plate 29, figures 1-4; 1-2, axial section of topotype, ×10, ×20; 3-4, axial sections of topotypes, ×10. [All from collection Tu-3A.] ——Plate 30, figures 1-4; 1-2, axial section of topotype, ×10, ×20; 3-4, axial sections of topotypes, ×10. [1-3 from collection Tu-3A; 4 from collection Tu-10.]——Plate 31, figures 1-6; 1-2, axial sections of topotypes, ×10; 3-6, sagittal sections of topotypes, ×10. [1, 5, 6 from collection Tu-10; 2 from collection Tu-12; 3, 4 from collection Tu-8.] ——Plate 32, figures 1-2; 1, part of specimen shown in Plate 30, figure 4, enlarged, ×100, to show structure of spirotheca and transverse septula; 2, part of specimen shown in Plate 31, figure 5, enlarged, ×100. [Both from collection Tu-10.] [All figures are unretouched photographs.]

Discussion.—DOUVILLÉ (1934) described the more fusiform examples of this species as *Neoschwagerina globosa* YABE, race *punica*, while he called the more globular specimens *Neoschwagerina globosa* YABE, race *subaequalis*. An examination of a large number of individuals reveals that a complete gradational series exists from one extreme to the other. Since the name *subaequalis* is hardly appropriate for the fusiform specimens, we are preserving the name *punica* and suppressing *subaequalis* as a synonym. The presence of well-developed secondary transverse septula shows that this species is a member of the genus *Yabeina*, rather than *Neoschwagerina*. DOUVILLÉ believed that this form was a variation of *Yabeina globosa* (YABE), but its smaller size and larger proloculus readily distinguish it from that species. In addition, the general appearance of the septula is different in the two forms. *Y. punica* differs from *Y. syrtalis* (DOUVILLÉ) in its smaller size, larger proloculus, fewer whorls, and more numerous septula. Also, the axial septula first appear at an earlier growth stage in *Y. punica.*

Occurrence.—We have found this species in collections Tu-3A, Tu-7, and Tu-8, from the upper part of the north slope of Baten Beni Zid. In Tu-7 and Tu-8 it is associated with rare specimens of *Dunbarula nana* KOCHANSKY-DEVIDÉ & RAMOVŠ, and in Tu-8 we have found a few specimens of *Yabeina syrtalis* (DOUVILLÉ). It is abundant in collection Tu-10, from the north slope of the southern ridge of Djebel Tebaga, and in collection Tu-12, from the southern slope of Djebel Tebaga. Thus, its range extends from below the earliest known occurrence of *Y. syrtalis* to somewhat above the latest known occurrence of that species.

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